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Electronics Australia

February 2000

Reviewed inside
three projectors
two DVD players

S-VHS from
standard tapes

LspCAD for
loudspeaker design

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phone call screener

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"One could be forgiven for thinking that these speakers were 10 times the price...The stereo imaging was truly outstanding...The VAF Signature I-51 system has one of the finest high frequency responses of any
Electronics Australia

"Are these the best kit speakers in the world?...On the evidence, we'd have to say that VAF's I-66 design would be odds on favourite to take out the award."
Best Buys Speakers, Amplifiers, Receivers

"... don't think there's any other way you could obtain this high level of sound quality at such a low price..."
Australian Hi-Fi

"The VAF DC-Series home theatre system exhibits a new benchmark of excellence in every criteria: construction, design finish , innovation...it seems almost churlish to mention the astounding value that each of these components represents."
Best Buys Home Theatre

"A new benchmark in excellence in every criteria: construction, design, finish, innovation."
Best Buys Home Theatre 97' 98'

"Highly and unreservedly recommended."
Best Buys Home Theatre

"... In value for money stakes or even sound for dollar stakes for that matter, they're nigh on impossible to beat."
Australian Hi-Fi

"We love the DC-Xs. These are true high fidelity speakers, and deserve a pedigree second to none. we are confident that that will be the case in time. Their performance is a revelation. The combination of the DC-Xs, the DC-6 and DC-2s is a happy, fully compatible, articulate and balanced system that beats anything we can think of in its price range. Actually,probably close to twice its price range."
Best Buys Home Theatre 98' 99'

"All areas of the DC-X's performance could easily be attributed to models costing a great deal more...The very design of the DC-x sets a few new standards in speaker engineering, some of which help it achieve incredible levels of versatility across amplifiers and source products and Home Theatre applications...Amazing value!"
Audio Video Lifestyle Magazine

"Unmatched performance at the price.The new DC-2 significantly raises the standard by which speakers at its price will be measured. This speaker is destined to become a classic."

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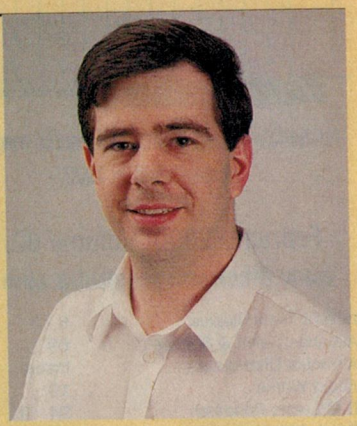
Viewpoint



Sit back and watch the data flow...

The other day I smuggled home the NEC DLP projector (reviewed on page 24) for the weekend, to watch a couple of DVD movies. Sitting there, It occurred to me that entertainment has driven a whole raft of technologies to increase the data storage and display densities well beyond their original design specifications.

Take, for example, the Compact Disc. CDs were a significant step forward in data storage, and at the time of their development nothing much came close in data density, portability and cost of manufacture. They were designed to take over from vinyl LPs, and the 74 minute play time was set (so I've been told) so that Beethoven's 9th symphony could at last be played without having to stop and change sides.

We were happy with that for a while, but then the idea of fitting movies on a CD started to sound appealing. This started the push for MPEG encoding , and the need for a higher data density on the disc. So it's back to the drawing board and lo and behold, the DVD appears. It uses the same basic technology as a CD, but everything has been pushed to the limit to fit more data on the disc.

Film sound tracks are another example. The optically encoded sound track running down the edge of the film was originally a pair of simple variable-width strips that supplied two channels of analogue stereo sound.

But we wanted more; so now we listen to our movies in full Dolby Digital surround sound, thanks to an increase in data density where the compressed digital information is packed in around the sprocket holes between the frames of the film.

Digital storage is, of course, ever growing in data density. But look at Flash memory cards — their huge increase in capacity over the years is due to the need for people to conveniently transport large files from handheld equipment. So what are these multi-megabyte files? Digital images of course, taken with the latest megapixel camera.

And then there's television. Black and white is fine, but we wanted colour. So everyone rushes off and finds a way of packing the colour information into the existing waveform. Ta da! Colour. Great! But we want more channels. OK then everyone, we'll all move up to UHF — there's now more bandwidth, and so we can send you more data (sorry, channels).

Now we're heading into digital television, with again an even higher bandwidth, and even more data. All this in the name of entertainment.

Yes, it seems that we love data, and the more we have the happier we are. Having written all that though, I'm starting to wonder. Is it perhaps the other way around: Are we instead simply taking advantage of increased bandwidth and cheap data storage to entertain ourselves?

Certainly 'entertainments' like MP3 music *rely* on the fact that you can keep a couple of hundred megabytes of MP3 files on your hard drive without stretching the budget — 10 years ago this would have been unheard of...

But do we really *need* high-definition television? Or 'Super Audio' CDs? Of course we do. Mainly because of the 'Faster Modem Principle' — once you've tried a higher speed connection, you'll never go back to the slower one. We have DVDs and HDTV because we enjoy it, and after all, enjoyment is what entertainment is all about.❖

Graham Cattley

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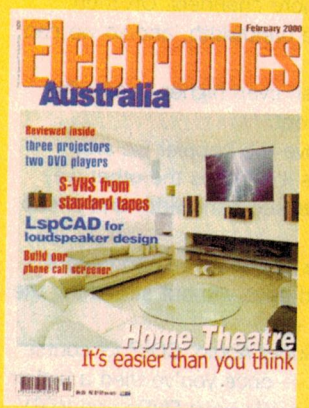

A home theatre system doesn't have to be obtrusive, as you can see... Shown here is Jamo's Digital CineMaster accompanied by a couple of nice couches and an even nicer plasma screen TV. Interested? Check out our massive home theatre feature, starting on page 12.

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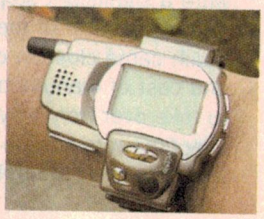

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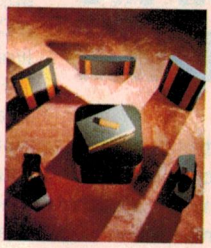

If you are interested in setting up your own home theatre system, you will have to get into new technology like DVD players, large-screen TVs and surround sound systems. With the price of this technology falling steadily, owning your own home theatre has never been more viable.

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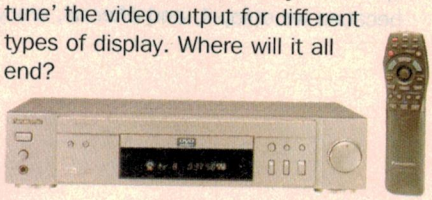

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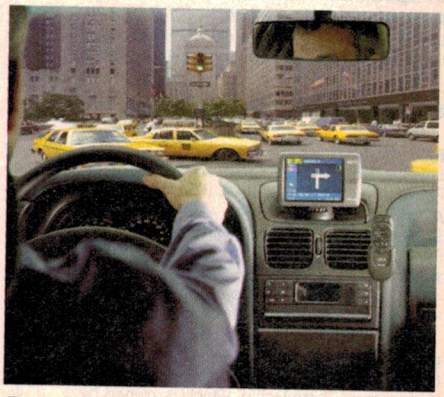

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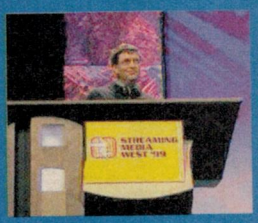

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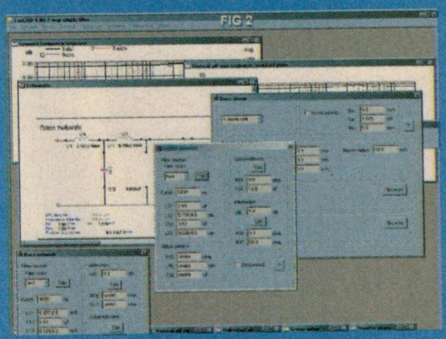

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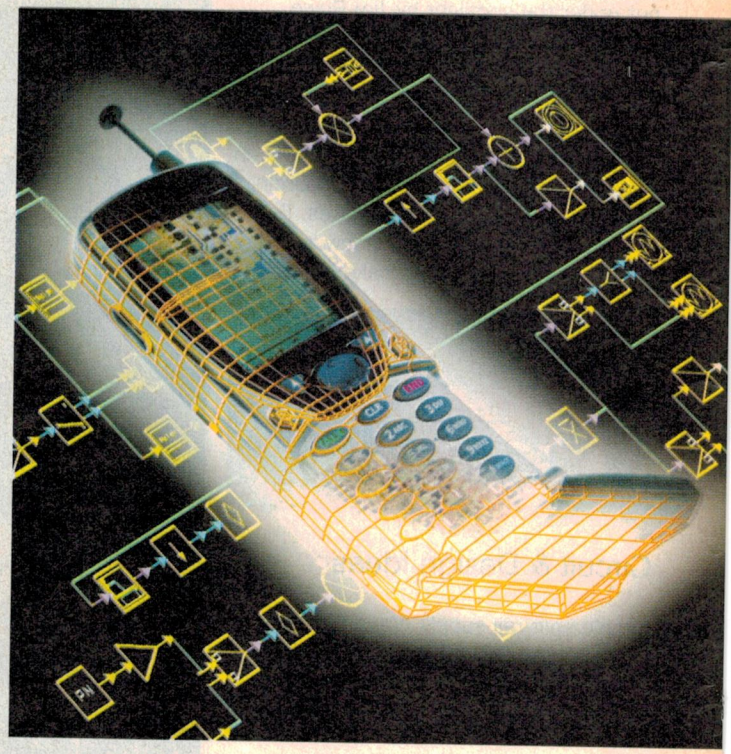

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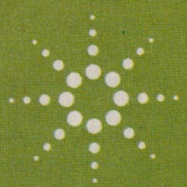

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WHAT'S new

in the ever-changing world of electronics

'Smallest & lightest' digital video camera

Panasonic says its new NV-EX3 is the world's smallest and lightest digital video camera — weighing just 400 grams. It's 10% lighter than its predessor the NV-EX1, and measures just 49 x 108 x 86mm (WxHxD).

The new upright-style digital video camera incorporates a 2.5" colour LCD monitor; Panasonic's super-fast 0.5-sec Jet Zoom (in recording pause mode); and 'quick start' operation, allowing the user to commence recording a fast 3.5 seconds after turning the camera on.

In line with the camera's ultra-compact size, Panasonic has developed a new thin lithium ion battery for the NV-EX3, which still offers 60 minutes of operating time. In addition, users can take advantage of LP recording mode — which extends the recording time of an 80-minute DV tape for two hours of digital recording with no loss in image quality.

The NV-EX3 offers the key features of Panasonic's current DV range, including new features first introduced with the DS99 digital video camera, such as Multi-Screen and Picture in Picture for recording and playback; playback digital zoom; and 'quick charge' batteries.

The NV-EX3 is priced at $4099 (RRP) and is available from leading electrical retailers. For more information contact Panasonic Customer Care on 132 600.

Nifty pocket 'scope

Dick Smith Electronics has released a compact pocket sized Monocular Telescope. With a magnification of eight times, DSE says it's ideal for sporting events, bird watching, concerts or the theatre, or any other event where clear vision would be ideal.

Like binoculars, the telescope has a focus ring that brings objects into focus quickly and effectively. With a field of view of 131 metres at 1000 metres, it can let you see things the naked eye could never reveal.

The telescope comes with a case and a cleaning cloth. Its 21mm coated lens surface reduces light loss and provides extra strength and protection.

The Monocular Telescope is available from Dick Smith Electronics Australia-wide and Dick Smith Electronics Powerhouse stores at Penrith, Bankstown and Moore Park in NSW and Carnegie and Nunawading in Victoria, for an RRP of $29.80. It is also available via mail ordre by calling Dick Smith Electronics Direct Link on 1300 366 644 or visiting its website at www.dse.com.au.

MiniDisc recorder from Denon

Denon has just added a full-function MiniDisc recorder to its range of hifi components. The Denon DMD-800 has an air-brushed gold or black anodised aluminium extruded face-plate of full size 'component' dimensions, assuring its place in any contemporary A-V entertainment system.

What could arguably be a world first is Denon's PICK-REC technology, which allows the listener to record the song he/she is listening to even if the song is nearly finished. Provided the MiniDisc recorder is in PICK-REC mode and there is available space on the disc, pushing the ENTER button will record the number from the very beginning. This innovative function outdates all other re-recordable formats, which depend on the user to record the entire program and later edit the material they wish to keep.

Denon says the DMD-800 has features which will make it the most versatile component of any home entertainment system, linking in with CD, DAT, MiniDisc, tape and other sources to provide a digital re-recordable music source of outstanding sound quality.

The recording circuitry of the DMD-800 is claimed to deliver high-quality sound not only from direct digital recordings (i.e, from a CD player with optical or digital output terminal) but from analog sources as well. The delta-sigma A/D converter produces a rich sonic image with broad, transparent dimensions and the 128fs, 3D digital noise filter brings out all the subtle nuances of music, from the powerful signals of the deep bass range to the delicate signals of the highest treble.

The DMD-800 MiniDisc recorder is available now from selected Denon dealers and is covered by a nationwide two year parts and labour warranty. It has an RRP of $899. For more information call AWA Audio Products on 1800 642 922.

Hot shot game controller

UK firm SpectraVideo/Logic 3 says that after only one year in the British retail market, its PC Avenger has proved to be a true champion. Featuring both analog and digital control in one ergonomically designed controller, the PC Avenger offers the 'best of both worlds' in one solid product. With the options of eight digital fire buttons or six with an analog throttle control, the pad can handle any game you want to throw at it.

Using its own driver, the PC Avenger is quick and simple to set up, allowing you to use the maximum amount of features with the minimum amount of effort. With its high flexibility and reliability, it's claimed to cater for everyone from the novice to the hardened gamer.

Features include an 8-button analog and digital pad for the PC; analog throttle and thumb stick; Windows 98/95 driver included; a dual speed turbo fire function; high grade micro-switches; and an 8-foot cable.

For more information contact SpectraVideo plc (UK Head Office), 33 Northfield Industrial Estate, Beresford Avenue, Wembley, Middlesex HAO 1NW England.

Denon's AVR-1600 gives you 5.1 channels of suround sound at a huge 300W (5 x 30W) for only $995. 11 surround modes with AC-3 and DTS decoding make the AVR-1600 an affordable way to get into home theatre.

Ultralight dual-band mobile

Panasonic has released its smallest and lightest dual band handset yet — the GD90 digital mobile phone. Available in metallic silver or glossy blue, it weighs just 88g and has the diminutive dimensions of 118 x 42 x 16.5mm (HxWxD). Panasonic has achieved this size without the need for cumbersome flips or sliding panels, just 'innovative design and superior battery technology'.

Discreetly recognising the urgency of incoming calls is easy with the GD90, with two screen backlight colours, green and amber, and the ability to identify five callers — with specific ring tones allocated to each number if necessary (a choice of 20 ring tones is available). Once the standard backlit colour has been selected, the phone will automatically switch to the other colour when it receives a call from any of the five numbers.

For those times when it's not convenient to take written notes, the GD90 makes it possible to record two voice memos of up to 15 seconds in length. Other convenient features include on-screen date and time display, and an alarm. The phone can also be set to turn itself on or off at pre-programmed times.

The dual band capability of the GD90 provides greater coverage and enhanced call quality in areas where two GSM radio frequencies (900MHz, 1800MHz) are available. In addition, dual band provides greater roaming capability, particularly when travelling overseas.

The GD90 is available at a competitive price via popular network plans. For product information, call Panasonic's Customer Care Centre on 132 600, or access the Web site at **www.ivibrat.com.au**.

Like all models in the Hitachi Gold Series range, the VMH855LE incorporates dual Digital Signal Processors for controlling image quality in both record and playback mode, offers up to 400x zoom and incorporates 'Perfect Power' Lithium Ion battery technology with up to 12 hours of operation possible.

WHAT'S new in the ever-changing world of electronics

Forward to the past

New York based firm Electro-Harmonix is doing its best to drag steam-age vacuum tube technology into the new millennium with the release of its new EL34EH — first in a line of 'premium quality' vacuum tubes that it plans for release throughout the year 2000.

The EL34EH is claimed to provide the smooth response and exceptional linearity of the classical Mullard and Telefunken types. According to technical journal *Vacuum Tube Valley*, 'The new EL34EH comes very close to the sonics of the Mullard EL34 from the 1960s... The Electro-Harmonix tube is balanced throughout the entire music spectrum. Bass goes deep and is tight, mids are sweet and well-defined and highs are detailed and extended.'

Features of the EL34EH include gold plated grids, a 'tuned bipolar cathode cover' that's claimed to optimise electron focus to the plate, precision alignment, and a 'secret tri-alloy plate material that virtually eliminates distortion and odd-order harmonics'.

Electro-Harmonix claims the new EL34EH is the perfect choice for both vintage and modern hifi equipment. 'It will make a Marantz, Dynaco, or Fisher sound like it did when it was out of the box, or add that 'Sixties warmth' to gear of the 21st century'.

For more information contact Electro-Harmonix at 20 Cooper Square, New York NY 10003 or visit **www.ehx.com**.

Plain paper SOHO faxes

Panasonic has released three new plain paper facsimiles, designed for the home and small office or as personal desktop systems.

The three new models are the KX-FM131AL, the KX-FP121AL and the KX-FP101AL. The KX-FM131AL is a compact multi-function system — when connected to a PC it can be used as a PC printer, scanner and fax modem. Both the KX-FM131AL and the KX-FP121AL offer fast, efficient 14.4kb/s fax transmission with a speed of up to nine seconds per page.

All three incorporate a full digital answering system for silent, fast operation, which will answer all calls, record messages and receive faxes while the user is away. A voice time/day stamp automatically logs each incoming message wih a time and day announcement. In addition, the digital 'full duplex' speakerphone is designed for clear two-way conversations. Digital compression technology reduces annoying echoes and call dropouts.

Other features include error correction mode, which checks documents line by line during transmission; sequential bradcasting for sending of multi-page documents to multiple locations; out of paper reception; and 64-level halftone resolution. The machines also offer six-station one-touch dial, 100-station speed dial, automatic redial, extension line transfer, automatic fax/phone switching and electronic volume control.

The three new faxes have RRPs as follows: KX-FM131AL, $799; KX-FP121AL, $599; and KX-FP101AL, $499. They are available from leading electrical retailers and communication specialists. For more information contact Panasonic's Customer Care Centre on 132 600.

12ppm laser printers from Brother

Many laser printer manufacturers are still producing machines that are printing at only 4-8ppm (pages/minute). Brother says its latest models, the HL-1240/HL-1250 set a new mark in print speed for personal business printers, at an impressive 12ppm.

The HL-1240/HL-1250 also offer resolutions of 600 x 600dpi and 1200 x 600dpi respectively. Add to this a standard 2MB of memory for the HL-1240 and 4MB (expandable to 36MB) for the HL-1250, and what users get is a compact little machine that can complete big print jobs quickly and effectively.

Another innovation that has been added is the user friendly on-screen interactive help. This effectively provides the user with a 'helpline' 24 hours a day, 7 days a week, 365 days a year. The on-screen interactive feature is an accompanying printing software that has animated shockwave movies which appear on the user desktop. The software demonstrates how to perform basic operations such as replacing toner cartridges and clearing mis-feeds.

A further user-friendly feature is front loading operation, which makes it easier for the user to access control panels, reload paper and change consumables.

The HL-1240/HL-1250 have PCL4 and PCL6 emulation respectively, as well as being compatible with Windows 3.1/85/98/NT4.0 and now MacOS 8.1. This gives the user the flexibility to print in DOS and makes it compatible with almost any computer set-up. Added to this is the ability to print on a variety of paper sizes, stocks and overhead projector film.

For more information, call your local Brother branch on (02) 9887-4344.

'Mini system for grown-ups'

Denon has released a new hifi mini component system that counters the belief that size matters when it comes to questions of sound quality and features. Promoted as 'a mini system for grown-ups', the new D-F100 mini component system has been specifically developed to introduce a wider audience to the rich, high-quality sound and the digital mastery for which Denon is renowned worldwide.

Using a discrete design normally afforded to more expensive component systems, the Denon D-F100 mini stands out from the crowd. Each of the four main components measures only 270 x 84 x 250mm (WxHxD), so the system can be set up snugly just about anywhere in a home, such as on a bookshelf or a mantlepiece.

But within that small space sits a powerful 30 + 30W AM/FM receiver/amplifier, a CD player and a pair of quality sounding speakers. All with many of the ingredients of Denon's high-end audio components, plus an optional cassette deck and MiniDisc player.

The receiver unit features a high-capacity heatsink and a large transformer to produce a clean, powerful sound; the CD player uses an 8-times oversampling digital filter to reproduce a lively, fresh sound; the MiniDisc recorder includes MD Pick Rec, a function that makes sure you don't lose any sound at the beginning of a track when you record; and the cassette deck offers Dolby HX-Pro and B/C noise reduction.

The Denon D-F100 Mini Component System is covered by a national 24-month parts and labour warranty and is available from selected Denon dealers at an RRP of $1295. The optional DRR-F100 cassette has an RRP of $395 and the DMD-F100 MiniDisc an RRP of $895. For more information call AWA Audio Products on (02)9669 3477.

Handsfree phone kit has built-in FM radio

Sports, music and news — now you can hear it all through a Portable Handsfree unit fixed to your mobile phone. Ericsson's innovative mobile phone accessory the 'Portable Handsfree with FM Radio' lets you listen to your favourite FM radio program, transforming your mobile phone into a portable FM radio as well.

The company says the new unit solves the dilemma of juggling a mobile phone and portable FM radio, by combining both. Just put the two earpieces in your ears, tune in the right channel and relax. If you are listening to the radio when you receive an incoming call, the sound from the radio is automatically muted.

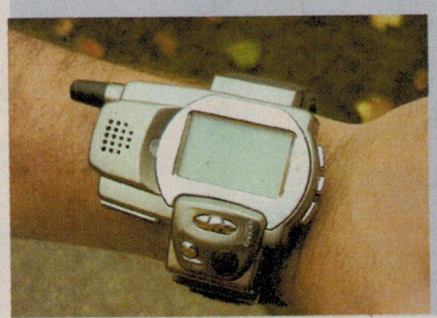
With a choice of two colours, black and light steel blue, the Ericsson Portable Handsfree with FM Radio also comes with its own stylish carry case. It's compatible with the following Ericsson GSM mobile phones: T10s, T18s, R250s, A1018s, 1888, GH688, GF768, GF788, Gf788e, GA628, S868, SH888.

Conversa with your watch

It had to happen sooner or later... This is a this is the world's first cellphone wristwatch, which as you may have noticed, doesn't have a keypad. Instead, the Watchphone lets you send and receive calls entirely through spoken commands.

Yes, you can tell it to dial specific digits, or program frequently used phone numbers entirely by voice commands, and even get it to read out email messages. Powered by some leading-edge, speech technology from Conversa, the Watchphone is the first product to result from a their strategic licensing agreement with Samsung.

The Watchphone is scheduled to be available in the U.S. later this year. It weighs 48g and measures 68 x 58 x 20mm, and offers 90 minutes of continuous call time with 60 hours standby. It also comes with a graphic LCD display, an ear microphone and includes a vibration alert.



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It's Easier Than You Think!

by Jim Rowe

Setting up your own 'home theatre' is much easier than it was, thanks to new technology like DVDs, large-screen TVs and surround sound systems. It's now possible to enjoy movies in your loungeroom with almost the same impact as a big-city cinema. Here's a quick rundown on how to achieve the best video and audio 'bang' for your money...

AS WELL AS being a pastime only for the seriously wealthy, setting up a home theatre used to mean buying noisy projectors and renting film prints from a library. The sound was mono and often quite 'low fi' and noisy — quite apart from the clatter of the projectors. It was all rather unsatisfying, and few people even bothered apart from dedicated home movie enthusiasts.

But that's all changed. Nowadays you can set up a home theatre system in your lounge or family room, which will show movies conveniently from video cassette, laserdisc, DVD video disc or Pay TV, on a large screen and often with full 5.1-channel digital surround sound. You can create very close to the full impact of a professional cinema presentation, without the hassle.

True, if you want to create the 'ultimate' home theatre setup it can still cost you many thousands of dollars. But once you understand how it all works, you'll discover that it's quite possible to achieve satisfying results with a much more affordable budget. In this article I'll try to show you how.

Let's begin by listing the basics of a modern home theatre system — some of which you may already have:

- A source of good quality video, such as a high-end VCR, a laserdisc player, a DVD video player or perhaps a Pay TV set-top box. Or as many of these as you can afford;
- A TV set, video monitor or projector capable of producing a satisfyingly large picture display;
- A surround sound decoder, capable of extracting or synthesising the additional 'spacial' signals from the stereo or encoded surround signals recorded on your videotapes, laserdiscs or DVDs;
- A multi-channel hifi amplifier system, capable of boosting each of the various sound channels, ready to drive your speakers; and finally
- A set of speakers, to recreate the full surround sound experience — including the gut-rumbling bass.

These are the basic requirements, but in each case there's quite a lot of flexibility when it comes to exactly how they're provided.

Some of the items can be either separate, or combined with others. For example many modern AV ('audio-visual') amplifiers and receivers have an inbuilt surround sound decoder, as well as all or most of the amplifier channels you'll need. Some DVD video players also have a built-in Dolby Digital surround sound decoder. One low cost alternative to full-blown Dolby Digital surround is to use a simple matrix-type analog decoder, plus some extra amplifiers and speakers to your existing stereo system; and so on...

If you want to set up your home theatre without spending any more money than is really necessary, it's wise to get a handle on the options

All of these options can be confusing, of course. But if you want to set up your home theatre without spending any more money than is really necessary, it's wise to get a handle on the options if you can. So let's now look at each of the main areas in turn, starting with...

Jamo's DCM1 'Cinemaster' system, with surround sound speakers and decoder. Oh, and that's the subwoofer it's sitting on in the middle there...

The video source

For most people, the easiest form in which to get movies for presentation in your home theatre is on rented videotapes. This means that a VHS-format VCR will be almost mandatory. Most Australian homes already have one, of course, although if it's a few years old your current VCR may not be capable of extracting from the tapes all of the video and sound information needed for satisfying home theatre.

Ideally you need a fairly high-end VCR with good modern video heads and circuitry, and — importantly — 'Hi-Fi' stereo sound capability. An older VCR with its worn heads and mono audio will certainly give you pictures and sound, but viewed on a large screen the picture will probably look rather blurred and snowy. And without even stereo sound signals to work on, the surround sound system will also be hard pressed to achieve much impact at all...

Apart from stereo sound capability, the other main features to look for in a modern VCR for home theatre use are those that ensure the sharpest, cleanest and most steady pictures. If your budget allows, this means things like digital video processing and enhancement; digital noise reduction; digital tracking; 'S-Video' or 'Y/C' separated luminance and chrominance video output; and digital timebase correction. The ability to play NTSC tapes may also be handy, to let you watch movies sourced directly from the USA.

Although many of the newer high-end VCRs also boast four or six video heads, as such these extra heads are generally not a great advantage for replay of commercial movies in your home theatre. They're mainly used to give cleaner and more stable 'single frame' images, and improve things like insert editing of your own recordings.

Laserdiscs and DVD

While you can get quite satisfying home theatre using a good modern VCR, you can get much *more* impressive results using a laserdisc or DVD video player. That's because both of these use laser-pickup optical discs instead of magnetic tape, and are capable of delivering sharper, cleaner and more steady images as well as improved multi-channel sound.

Top: JVC's new S-VHS high quality VCR uses standard tapes and gives great results (see our review on page 62). Middle: Sony's DVP725D DVD player. Bottom: The Philips DVD913 DVD player offers 'super suspension' and the ability to read CD-RW discs too.

The older 'analog' laserdiscs have been available for some time now, and although technically obsolete they still provide an excellent way to watch movies with very high-quality video and stereo sound. The best range of titles is on American NTSC-format discs, which can still be imported directly from the USA.

Despite their fairly large 300mm size, laserdiscs can only store up to 30 or 60 minutes per disc side, depending on the type of recording used (CAV or 'standard play', versus CLV or 'extended play'). This means that depending on its length, a movie may need from one double-sided disc up to 4-5 disc sides — so with laserdiscs there's a bit of disc flipping and/or swapping per movie.

Although they're a bit expensive new, you can now often pick up movies on second-hand NTSC laserdiscs for about $25 - $35 per title. (Because they're played by a laser, they don't 'wear out' like videotapes — so second-hand discs are often a good buy. Just inspect them for scratches and other damage.)

DVDs are much smaller than laserdiscs (120mm), but because of the digital compression system used they can fit a complete movie on a single disc. They're quite reasonably priced ($30 - $35 per movie new) and capable of even better performance than laserdiscs, but they're still a bit new so the range of titles available is limited compared with videotape.

DVDs also use a regional coding scheme, designed to make it hard to import and watch discs from the much larger range available already in the USA. For this you need to obtain either an American 'Region 1' player or one that has been unofficially modified to play discs of 'all regions'. Luckily, the software marketers are now releasing movie titles at an impressive rate in our own 'Region 4', so the problem is starting to fade away.

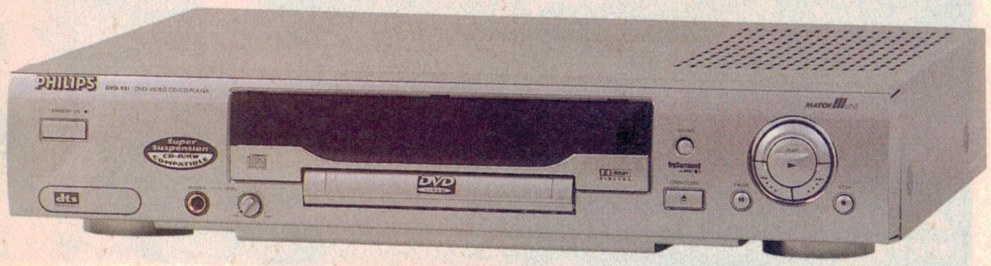
One way or another, then, a DVD player is very desirable for your home theatre system — especially if you want to experience the full impact of 5.1-channel Dolby Digital or other forms of discrete digital surround sound. DVD is really the only way to achieve this at present; although some of the newer laserdiscs do provide 'digital' surround sound, it's generally only a digitised version of four-channel analog 'matrixed' surround sound like Dolby Pro-Logic. That's all most laserdisc players can decode anyway.

DVD players either have a full 5.1-channel Dolby Digital decoder built in (possibly combined with a decoder for DTS as well), or at least make the digital audio bitstream available to drive an external decoder.

Players which do include a built-in decoder, like the Pioneer DV-626D, Panasonic DVD-A360A or Kenwood DVF-5010M, can save you quite a bit of money. That's because most of the surround decoders built into existing AV amplifiers and receivers are designed for decoding Dolby Pro Logic or the simpler Hafler-type decoding from stereo sound tracks.

So if your budget won't stretch to a DVD player with a built-in Dolby Digital/DTS decoder, but you still want to be able to hear digital multi-channel surround sound in all of its glory, you'll need to get either a separate decoder or a new AV amp/receiver with the decoder built in.

At the very least, to leave your options open, make sure you get a DVD player with



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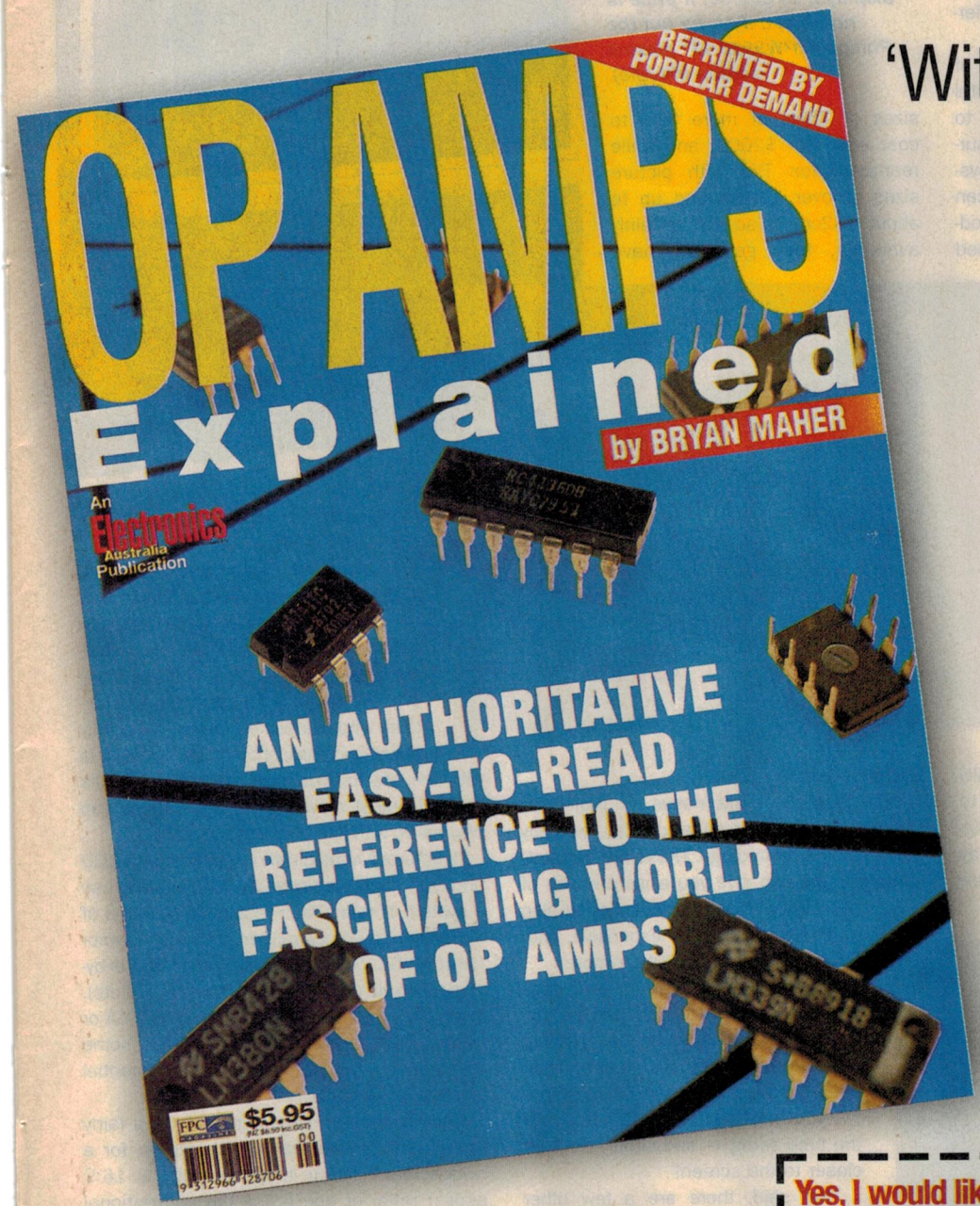

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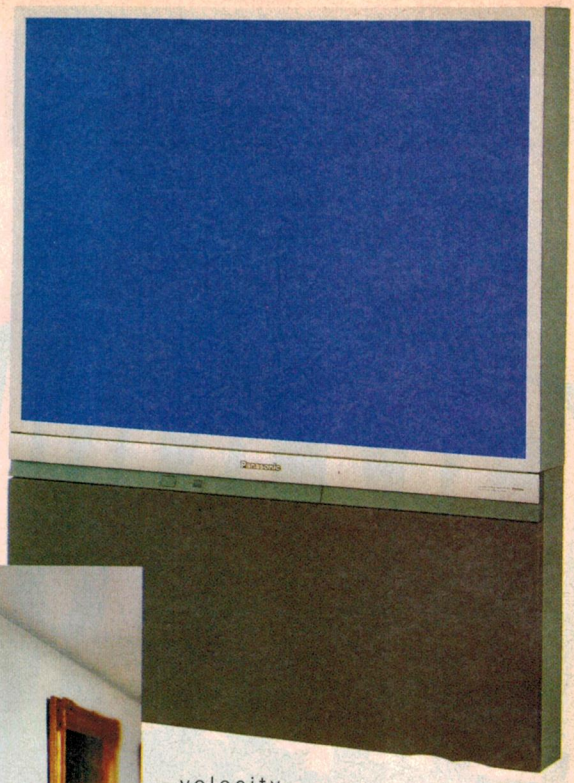
digital and/or optical 'bit stream' audio output, as well as the usual video and 'mixdown stereo' audio outputs. This will ensure you'll be able to drive a decoder in the future. In the meantime, you can use the player's stereo outputs to drive a Pro Logic or Hafler-type analog surround decoder.

By the way, although the vast majority of current DVD Video discs have Dolby Digital surround sound, with anything from one to six channels, they can also have digital surround encoded via other compression systems such as DTS or MPEG-2. Or they can have uncompressed 'linear pulse code modulated' (LPCM) digital audio, like that used on CDs but with 48kHz or 96kHz sampling rather than 44.1kHz. So ultimately you may need other digital surround decoders as well as the one for Dolby Digital.

Larger display

For a visual impact close to that of your favourite cinema, your home theatre needs to be able to present you with a picture that occupies much the same proportion of your visual field of view as a typical cinema screen. In one sense, then, the idea is to get a TV set or video projector that provides the largest possible image. The bigger the better — providing you can afford it, and your lounge room has the space!

It isn't that simple, of course. For a start, prices tend to go up quite dramatically with picture size. You may not be able to afford, or justify, the cost of a really big-screen image. Conventional CRT (cathode-ray tube) based TV sets with diagonal picture sizes of 75cm or more tend to cost well over $2000, and while rear-projection TVs with picture sizes of over 100cm and up to about 132cm or so are certainly available, they generally have prices of $4000 - 5000.



If you want a big, cost effective screen, then rear projection is the way to go: The Panasonic TX51P15H (top) and the Sony KPEF41SN2 (bottom) are prime examples of these lower cost displays. Of course, if price is no object, then try out the Philips 42PW9982 42" plasma screen (middle).

One theoretical alternative to projection sets is the large flat panel display, typically using plasma technology. These are certainly compact, and can give you a picture size of say 125cm diagonal. But they're also quite heavy and very expensive, with prices typically $20,000 or more.

To a large extent, then, your decision on picture size may well be dictated by cost as much as anything else. If your budget is limited, and you already have say a good 68cm stereo TV, you may elect to stick with it for the time being — and simply sit a bit closer to the screen!

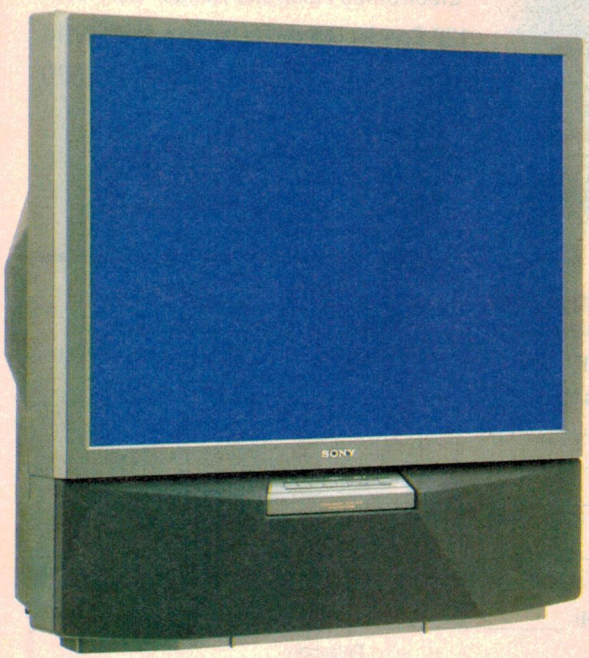
That said, there are a few other aspects to bear in mind if you *are* choosing a larger screen TV or display for home theatre. One is that the larger you make a video image, the more visible tend to be its line structure and other video imperfections. That's why many of the better large-screen sets and projectors incorporate special (and expensive) features like digital scan conversion 'line doubling', comb filtering to reduce the interference between luminance and chrominance information ('dot crawl', or 'Moire patterning'), velocity modulation to improve video sharpness, and so on.

The larger the picture gets — or strictly, the larger it looms in your field of view — the more valuable these high-tech enhancements become. So if your budget allows, go for a model with as many of these features as possible; they certainly improve picture impact. (The only possible complication of line doubling is with the Macrovision copy protection signals built into most movies on DVD — these can play havoc with line doubling circuitry.)

A different consideration applies with LCD and DLP video projectors, which generally use a system of rating their resolution in terms of either equivalent computer graphics adaptor format (VGA, SVGA, XGA etc) or horizontal-by-vertical pixels (800 x 600, or 1024 x 768 etc). In general, you need to go for at least SVGA or '800 x 600' resolution for acceptable home theatre use — and to achieve the full potential of DVD, for example.

Another thing to consider, and it's a fairly thorny one, is whether you should go for a 'widescreen' TV or projector with a 16:9 aspect ratio, or one giving the conventional 4:3 aspect ratio. This is one area where there's no clear-cut answer at present.

Movies have of course been made in widescreen format for many years, and the video versions are often released in 'letterbox' format to allow you to see the full image from the original film. This means that on a conventional 4:3 TV set or video projector, some of the display area is wasted showing black horizontal strips above and below the actual picture. With a 16:9 display, the image itself can occupy the full screen for better impact.



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On the other hand, a 16:9 widescreen display can't do full justice to the 4:3 aspect ratio of older movies, or today's broadcast TV.

Some large-screen sets and projectors let you magnify these narrower images, either linearly (where the top and bottom tend to be cropped off) or parabolically — where the sides of the image tend to be stretched outwards to fill the screen, hopefully without too much obvious distortion.

Either approach tends to involve a compromise, and which way you go probably depends on what material you expect to watch the most. If you're mainly going to be using your home theatre to watch movies, a widescreen 16:9 display may be the right choice. Otherwise, you may prefer to stick with a conventional 4:3 type.

A final point to note is that if you possibly can, make sure you get a large-screen set or video projector with at least S-video or 'Y/C' separate luminance and chrominance inputs, and ideally the latest component (Y/B-Y/R-Y, or Y/Cb/Cr) inputs as well. These inputs will generally allow the display to produce sharper and cleaner pictures than the older composite analog video inputs, and you'll be able to take better advantage of the high image quality available from sources like DVD video players. Most DVD players provide a Y/C output, and the latest models also provide component video outputs.

Surround decoder

An important part of the overall impact of a modern movie presentation is of course provided by its surround sound, and if your home theatre is to achieve a similar impact it needs to provide for this too.

In the form they're shown in the cinemas, modern movies generally have multi-channel digital surround sound tracks with dynamic range expansion and so on. There are a variety of systems in use, but perhaps the three best known are Dolby Digital, DTS (Digital Theatre System) and Sony Dynamic Digital Sound (SDDS). These all involve digital audio compression, of anywhere up to seven separate channels.

Not surprisingly, movies released in the last few years for home viewing on tape, laserdisc or DVD tend to have sound tracks with variations on these same surround sound systems, or 'stereo mix downs' derived from them. This means that generally there's at least two-channel stereo information, and often enough additional encoded surround information to drive various types of surround decoder.

With laserdiscs, you generally get analog and/or digital stereo, which may also have matrixed Dolby Pro-Logic surround sound information. Just about all DVDs provide Dolby Digital and/or DTS tracks, with anything from mono right up to 5.1-channel discrete digital surround information, depending on the original movie. With full '5.1 channel' discrete surround sound, that means five full-bandwidth channels (right, left and centre front, right and left rear) plus a reduced-bandwidth 'low frequency effects' channel that's basically used to drive a subwoofer.

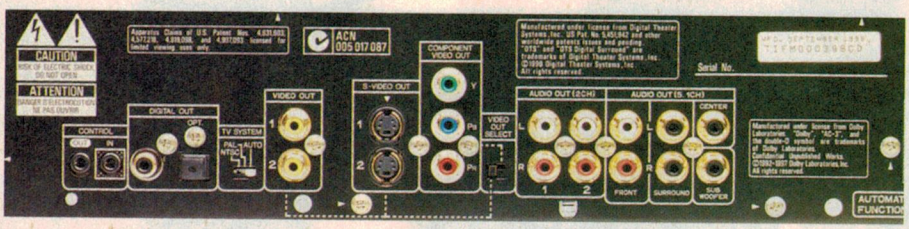
Your audio options, then, will depend at least partly on what medium you're using to play the movie concerned. If you're playing it from a videotape, your 'Hi-Fi Stereo' VCR will generally provide either plain stereo or stereo with matrixed Dolby Pro Logic surround information. (Actually even 'plain stereo' often contains at least basic surround sound information, extractable using a Pro-Logic or simple Hafler type 'decoder'.)

So with a VCR you can use either a simple analog matrix decoder or a 'smarter' Dolby Pro Logic decoder (as built into many AV amplifiers and receivers), to provide what can be quite satisfying 'analog surround sound'. And basically the same applies if you're using a laserdisc player.

Of course the same options are also still available if you're going to be playing movies from a DVD player, but in this case they're only the start. That's because a DVD player gives you the further option of achieving the full 'digital surround sound'. Here you'll need one or more decoders, though, to do the digital decoding.

Many of the latest AV amplifiers and receivers *do* incorporate Dolby Digital and/or DTS decoders. You can check this by looking for the digital 'bitstream' input sockets on the rear — usually either a single RCA socket marked 'Digital In', and/or an Optical Input connector.

If your amplifier or receiver is one of the older type designed for only stereo, or Dolby Pro Logic



Top: Pioneer's DVD626D offers a built-in decoder for both Dolby Digital and DTS 5.1-channel digital surround sound, component video outputs as well as S-video and composite video.
Middle: The MarantzSR18 A/V receiver with built-in surround sound decoder.

Bottom: Here's Pioneer's A/V receiver, the VSXD608.

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analog surround, you'll need to use either a separate digital decoder box (if you can find one — they're still fairly rare), or get one of the DVD players with a Dolby Digital and/or DTS decoder built in.

Multi-channel amp

Regardless of the kind of surround sound decoding you elect to use, you'll still need a multi-channel amplifier system to boost the various audio signals up to the level needed to drive loudspeakers. How many amplifier channels you'll need will depend on the level of complexity your budget will allow, and also partly on the kind of decoding you're using.

At the simplest level and with analog-type decoding, you can get away with a total of only three channels — two to handle the main front speakers and a single modest-power 'rear surround' channel driving a rear speaker or two. The two front channels might well be provided by your existing stereo amplifier, so all you'd need to add is a single mono amplifier.

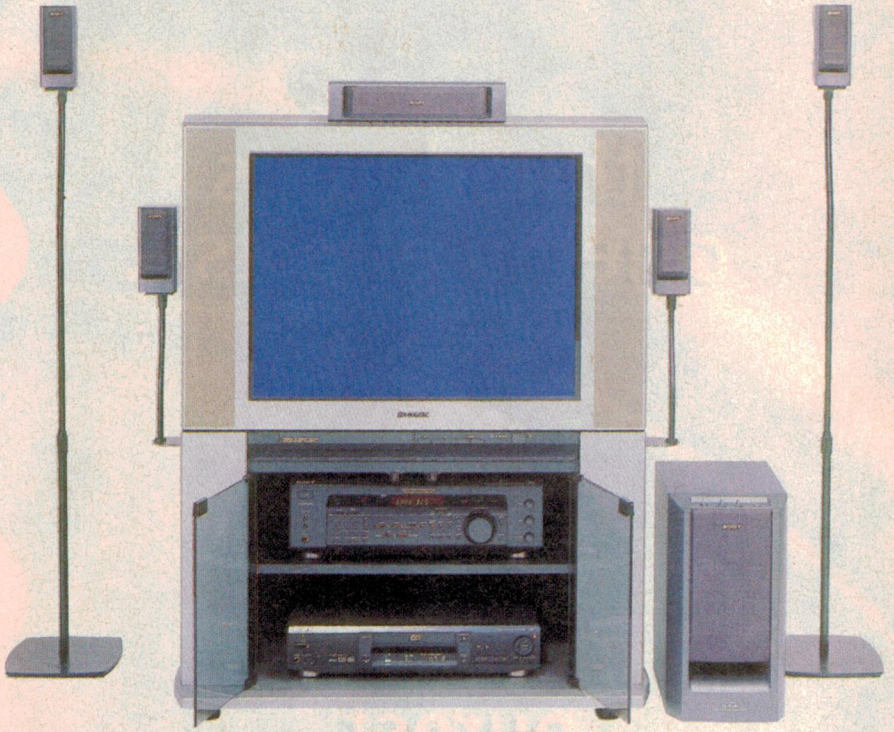
The next level up with this kind of setup would be to add a fourth channel, say to drive a subwoofer for more satisfying bass. This might only involve making your add-on amplifier a low cost stereo unit, instead of mono. Your main stereo amp could still handle the two main front channels.

This level of complexity can give quite satisfying surround sound from an analog/Dolby Pro Logic surround decoding system, and at relatively low cost. However if you have Dolby Digital/DTS discrete surround decoding and want to go further, you'll need to add a fifth and sixth channel, to handle the front centre and second rear surround channels. (Once you go to discrete surround the front centre channel really becomes mandatory, because most movies have their dialogue on this channel.)

Going this far can get messy, adding additional power amplifiers. A neater solution may be to get one of the multi-channel AV amplifiers or receivers, designed specifically for the job. Most of the larger and well-known manufacturers make a range of them, with different configurations and output power ratings.

Note, though, that very few AV amplifiers or receivers include a power amplifier channel for the subwoofer. Mostly they provide the subwoofer output at 'line' level, ready to drive a separate subwoofer amplifier or 'active subwoofer' (i.e., a subwoofer speaker with its own built-in power amplifier).

For a typical home theatre setup, I'd suggest an amplifier or receiver with say 50 - 80 watts output for the two main front channels, and perhaps 30-50 watts for each of the other two or three channels. The subwoofer amp should provide about 80-100 watts. By the way, we're talking here of true continuous power rating, not the inflated 'PMPO' ('peak music power output') ratings beloved by those who market mini music systems.



Top: Pioneer's VSXD908TXG audio/video multi-channel receiver
Middle: Sony's 'Complete Pack' with DVD, A/V DSP receiver, complemented by their 150 family of surround sound speakers.
Bottom: Pioneer's HTV-1 'Simple Solution', has a set-top control centre (with built-in speakers), and a hefty subwoofer.

Surround speakers

As with the amplifier system you use for your home theatre, you again have quite a bit of flexibility when it comes to the speakers. If you have a couple of good speakers in your existing stereo music system, these will probably be fine for use as the main front speakers in your home theatre setup.

In that case, you may well only need one, two or three smaller speaker boxes for the front-centre and rear channel(s), plus perhaps a subwoofer, if you decide to have one. Just make sure that the speaker you use for the front-centre position is of the 'magnetically

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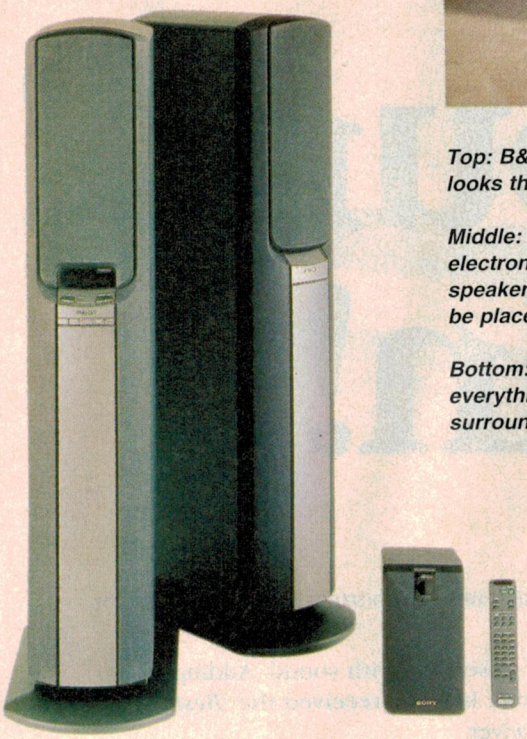
shielded' type, so its stray magnetic field doesn't upset the picture tube in your TV or video monitor. The centre channel speaker usually ends up either sitting on top of the TV, or immediately below it (or the projector screen).

Of course your existing stereo speakers may be very small, or getting a bit old and 'tired'. In this case you may prefer to 'start from scratch' with your home theatre speakers, instead of simply adding to your hifi setup.

With this option, although you can certainly collect a set of speakers from different makers — or even build your own, of course — your simplest and often safest approach is to buy a complete set of speakers from one manufacturer, designed specifically to operate together and complement each other in a surround sound system. Most of the well-known manufacturers produce a number of these 'matched sets', offering different performance levels, power ratings and of course cost. Some take a slightly different approach and offer a variety of 'front main' speakers, plus various 'surround channel', 'front centre' and subwoofer models to complement them.



Top: B&W's chunky subwoofer certainly looks the part.

Middle: Sony's SAVA59 has all the electronics hidden away inside the main speakers, leaving the mini control unit to be placed on a self or coffee table.

Bottom: NEC's HT750 system contains everything you need, including a surround sound decoder with remote.

Again some of the larger manufacturers offer 'package deals' which include a multi-channel AV amplifier or receiver (often including say a Dolby Pro-Logic decoder), plus a complete set of speakers. Although these packages generally aren't capable of providing the very 'ultimate' in performance, they *can* offer very good value for money — and can provide more than enough impact for most of us.

It's true that to achieve the absolute maximum impact from your home theatre, you need a set of high-end surround sound speakers, plus of course a matching amplifier system driven by a Dolby Digital/DTS decoder. (Not forgetting the corresponding large screen TV or video projector, complete with line doubling etc.) In that case you'd probably also want to go for an amplifier and speaker system carrying the Lucasfilm 'THX' (Tomlinson Holman Experiment) certification — which is designed to ensure that the system is capable of delivering the full potential of systems like Dolby Digital and DTS, and recreating the 'cinema experience' in your smaller environment. If you go for this level, though, you'll need a very healthy bank account.

For most of us, it's a matter of balancing our expectations against our budget, and accepting a few compromises along the way. If you're prepared to do this, you can still end up with a home theatre setup that delivers very satisfying performance, for a much lower outlay. Good luck! ❖

What the jargon means

Here's what the most common home theatre jargon means:

Audio Bitstream: An undecoded digital audio output, provided by many DVD players to allow external decoding back into multi-channel surround sound. Needs to be used if the player does not have its own built-in decoder for Dolby Digital, DTS etc.

Comb Filter: Circuitry used in professional video monitors and some high-end TV receivers to separate luminance (B&W) and chrominance (colour) information, for minimising interference effects.

Component Video: PAL or NTSC video separated into three components — the B&W or luminance (Y) information and two colour information components, B-Y (alternatively called Cb or Pb) and R-Y (also called Cr or Pr). The video is actually stored on DVDs in this format, and the best picture reproduction is achieved by using these signals without combining them.

Composite Video: PAL, NTSC or Secam video which has all of the picture and sync information combined into a single 'composite' signal. Uses a single RCA plug and socket connection.

Dolby Digital: The digital audio compression system used for most DVDs, originally developed by Dolby Laboratories for cinema use (formerly called 'AC-3'). It can deliver from one to '5.1' fully discrete (separate) decoded audio channels.

Dolby Pro Logic: The most developed and 'intelligent' of the earlier analog surround sound decoders, with enhanced steering logic and noise reduction. Can extract surround sound from analog 'stereo' signals.

DTS: An alternative multi-channel digital audio compression system developed by Digital Theatre Systems, used in many movies and encoded on some US DVDs, usually instead of Dolby Digital.

DVD: Digital versatile discs, 120mm in diameter. One DVD Video disc can contain a complete movie with up to eight sound tracks, subtitles, trailers, 'making of' features, deleted scenes etc.

Line doubler: Circuitry in some professional video monitors and high-end TV receivers which effectively scan-converts the video signals into a high-definition format, to reduce the visibility of scanning lines and also reduce field flicker.

LPCM: Linear pulse code modulation, or uncompressed digital audio as used on audio CDs. Some DVD Video discs apparently provide LPCM stereo audio.

MPEG: Motion Picture Experts Group, which sets international technical standards for DVD Video, etc. DVD Video discs use MPEG-2 'Main Profile at Main Level' (MP@ML) video compression.

MPEG-2 audio: The multi-track digital audio compression system preferred by MPEG, and originally planned for use on DVDs in Australia, NZ and other Region 4 countries. Capable of providing 7.1 channels, but as yet seems to be rarely used.

NTSC: The (analog) TV and video system used in the USA and Japan, named after the US National Television Standards Committee.

PAL: The (analog) TV and video system used in countries like Australia, New Zealand, Germany and the UK. Essentially an improved version of NTSC — PAL stands for 'phase alternate line'.

Passive Matrix decoder: A simple and low cost analog surround sound decoder, based on a resistor network. Can produce four surround channels from analog 'stereo'.

SDDS: Sony Dynamic Digital Sound, a multi-track digital audio compression system used in cinemas.

S-Video: Analog video in which the luminance (B&W or 'Y') and chrominance (colour or 'C') information have been separated — allowing both to be of higher bandwidth without interference. Used to obtain improved picture quality from VCRs and DVD video players. Generally uses a miniature 4-pin plug and socket.

THX: An initiative of LucasFilm, to achieve optimum surround sound in both cinemas and home theatres. The Home THX standard specifies basic amplifier and speaker performance — plus enhancements — which allows 'cinema impact' to be achieved in the typically smaller home theatre environment. ❖

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NEC's nifty LT84 DLP Projector

The new NEC LT84 is very different from the majority of multimedia/video projectors currently available, because it's based on Texas Instruments' DLP technology — where the image is formed by hundreds of thousands of microscopic pivoting mirrors. But how does its performance compare with familiar LCD projectors? That's what we were interested to find out, when we were able to get our hands on a review sample...

by Jim Rowe

THERE'S NO DOUBT that the first thing you notice about NEC's new LT84 multimedia projector is its small size and low profile. Unlike many projectors that *claim* to be 'ultra portable' without really achieving it, this one does. The actual package measures only 294 x 235 x 58mm, not including the lens cap and feet, and the all-up weight is a mere 2.5kg.

But although the box itself may look puny, the performance specs certainly aren't. The rated light output is a healthy 700 ANSI lumens, with a native image resolution of 800 x 600 pixels — which means it's a natural for S-VGA computer graphics and also high quality video like that from laserdiscs and DVD players. As with many S-VGA projectors the inbuilt processing (here 'Accublend') can also smoothly compress 1024 x 768 pixel 'XGA' graphics for display too.

Other nice features include Y/B-Y/R-Y component video inputs, as well as the usual composite and S-video inputs; compatibility with all common video systems (i.e., PAL, NTSC, NTSC 4.43 and Secam); a PC card slot, with the ability to both capture images on a PC card and view them as a 'slide show' without the need for a computer; the ability to 'drive' the projector via a standard USB mouse; and also the ability to digitally 'magnify' an image up to 400%.

"Unlike many projectors that claim to be 'ultra portable' without really achieving it, THIS one DOES..."

But perhaps the nicest feature of all is that the LT84's projected images are claimed to be particularly smooth and 'film like', almost free of the 'pixellation' and 'jaggies on oblique lines' artifacts that you tend to find with the majority of LCD-type projectors.

The reason for these smoother images is what makes the LT84 especially interesting. That's because it's based not on LCD imaging technology, but on the DLP (digital light processing) technology developed by Texas Instruments, where the image is formed by a huge number of pivoting microscopic aluminium mirrors inside a sealed 'digital micromirror device' (DMD).

You'll find a bit more information on DLP and the way DMDs work in the sidebar, if you're interested. However the main advantage of the DLP system in terms of performance, compared with LCD technology, seems to be that because those tiny mirrors

are spaced only 1um apart, the optical efficiency of each pixel cell is very high — about 90%, in fact. (Meaning that of the total light falling on a pixel cell's overall area, 90% can be controlled and passed through to the lens and screen.) This is significantly higher than the figure for LCD cells.

As well as allowing a brighter image and better contrast range, the smaller 'dark gaps' between the pixels give the projected image a much lower level of pixillation and jaggy edges, compared with an LCD image. There's still a small amount, but much less.

A further advantage again of the DLP system is that those rapidly pivoting mirrors seem to have a faster response than even active-matrix TFT driven LCD cells, and virtually no visible 'lag' or 'smear'. The duty-cycle modulation also has the potential of delivering better grey-scale and colour linearity, at least in theory.

In the NEC LT84, the single 0.67" DMD device is combined with a 120W P-VIP lamp and an efficient (f/3.0 - f/3.3) 28 - 33mm manual zoom lens, to deliver 700 lumens with a contrast ratio of 250:1 (ANSI).

As you'd expect, coming as it does from NEC, the LT84 is also a true 'multisync' projector, able to adjust automatically to virtually any horizontal scanning rate between 15kHz and 85kHz, and any vertical rate from 50 - 85Hz.

Like many multimedia projectors the optical axis of the LT84 is raked upward by 12 - 14.5° (depending on zoom setting), to allow it to be placed on a relatively low horizontal surface and still produce images on an elevated vertical screen that are evenly focussed and free from 'keystoning'. The projector itself can be tilted from the horizontal by up to +/-15° maximum, and does have built-in adjustable keystone correction. It can also be suspended (upside down) from the ceiling.

It mightn't look it here, but the LT84's remote is really tiny: credit card sized, in fact.

The remote control supplied with the LT84 is a very compact (credit card size) unit, which handles all of the main functions. However an optional 'full function' remote of more usual size is also available, if desired. This includes a laser pointer and also has the ability to operate as a computer mouse.

The LT84 also comes with a well-padded soft carrying case, a lens cap and retaining strap, various cables for connection to computers and video sources, and of course a user manual.

What we found

Thanks to the friendly people at NEC Australia, we were able to try out one of the very first LT84s to reach our shores. Needless to say I was particularly keen to try it out as a home theatre projector, for this month's feature, although I did also run through its tricks as a PC-based and self-con-

The various ins and outs, on the side (shown here only a whisker larger than actual size). The component video inputs are built into the 15-way RGB connector.

DMDs and Digital Light Processing

At the heart of the Texas Instruments Digital Light Processing (DLP) technology used in projectors like NEC's LT84 is the Digital Micromirror Device or DMD, which is where the image is actually assembled. The DMD is essentially a huge array of microscopic aluminium mirrors, pivoting back and forth individually under the control of digital image processing circuitry.

There's one tiny mirror for each pixel of the image, so for an 800 x 600 resolution DMD like that used in the LT84, there are no less than 480,000 mirrors. Each mirror is only about 16um (micrometres) square, with a gap of only 1um separating it from the mirrors on each side. And the images are formed by tilting each mirror of the array diagonally, one way or the other by +/-10°, so that it either reflects light from the projector lamp towards the lens, or not.

The tilting is done by electric fields; beneath each mirror there are two electrodes, whose voltages are driven by a CMOS memory cell under the electrodes again — so the data stored in each cell determines which way its mirror is tilted. The mirrors are supported by extremely thin 'torsion bar' pivots, measuring only about 1um wide and 0.1um thick.

With the DLP system used in the LT84 projector, there's only a single DMD device which is used to produce all three primary colours. A rapidly rotating colour filter wheel is used to shine red, green and blue light on the mirror array in turn, and each time the mirrors are fed the correct information to create the image for that colour. Persistence of vision blends the three coloured images into a single full-colour image.

Needless to say you can also have a three-DMD projector system, where each DMD handles the imaging for one of the three primary colours. This needs no rotating filter wheel, but fixed filters and a more complicated optical splitter/recombiner system (plus three of the expensive DMDs) .

In a single-DMD projector like the LT84, those 480,000 mirrors are in almost constant motion — not just to cycle through the R-G-B images at say 150Hz (i.e., one sequence per TV field), but in fact much faster again. That's because their positions are duty-cycle modulated by the digital drive circuitry, to achieve linear modulation of pixel brightness and colour. TI literature suggests that on average the mirrors switch every 200us (microseconds), or about 5000 times every second of operation. Impressive, don't you think?

As you might guess, the DMD is made very much like any other IC, using photolithography, chemical vapour deposition, oxide masking, etching and metallisation techniques. They're also made in the same ultra-clean room conditions, to ensure that no dust particles find their way inside to disrupt mirror operation.

The nett result is that despite what you might expect, DMD devices are *very* reliable and have an extremely long anticipated working life. TI has done accelerated-life tests suggesting that the latest DMD devices will typically have an MTBF (mean time between failures) of 119,000 working hours.

Sounds incredible, doesn't it? But those tiny mirrors are extremely light, and only swing back and forth through a total of 20°. The tiny torsion-bar pivots are also only a single metal grain thick, so they apparently don't develop fatigue cracks like thicker metal bars given the same treatment.

If you're interested in more information on DLP and DMDs, you'll find it at the Texas Instruments website: **www.ti.com/dlp**.

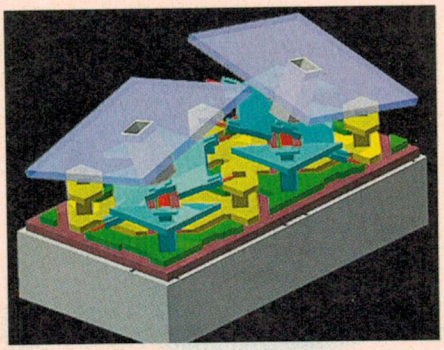
tained data projector for business presentations, just for the record.

Not surprisingly there were no problems using it for computer graphics. The image quality in standard SVGA (800 x 600) mode was very clean and smooth, while that with compressed XGA (1024 x 768) mode was very similar. The PC card capture and 'slide show' functions worked well, too.

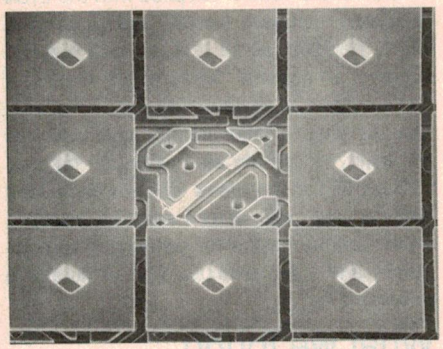
To check out the LT84 for home theatre use, I was able to set it up in my fairly typical viewing room, about 3.5m from my matt white screen. This allowed me to get an image of about 1.7m diagonal, with the LT84's zoom lens at its longest setting.

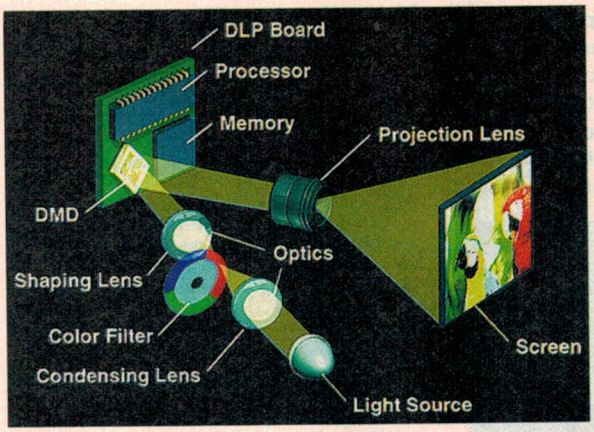
I was able to try the projector out with a number of video sources — two different DVD players and a laserdisc player, and using NTSC as well as PAL. The laserdisc player provided good quality composite video NTSC, while my Kenwood DVF-5010 delivers good PAL/NTSC S-video and the Panasonic DVD-A360A I had for review at the same time provided good component video, again both NTSC and PAL. (The LT84 doesn't come with the special adaptor lead you need to drive it with component video, but the connections were given in the manual so I was able to make one up quickly...)

One of the DVDs I used with both players was the Video Essentials test disc (DVDI-0711), and this together with a couple of new movie DVDs allowed me to give the LT84 quite a good workout.



Below, a scanning electron microscope shot of some of the DMD mirrors, with one removed to show the electrodes and pivot underneath. Above, a drawing showing how the mirrors pivot diagonally by +/-10 degrees. They're only 16um square...





How a single DMD is used in projectors like the LT84, with a motor-driven colour filter wheel and the mirrors displaying the R-G-B images in rapid sequence.

Frankly I found very little to complain about; the overall performance of the LT84 on video is especially satisfying. While at 700 lumens it's by no means the brightest projector around, the output is nevertheless fine for a typical home theatre situation. Subjectively the lighting uniformity is also quite good, although my light meter suggested it's not quite as good as the Panasonic PT-L557E in terms of centre-to-corner ratio.

In the crucial area of overall image quality, though, the LT84 really shines. Thanks to that DLP technology, the picture is indeed very much like that from film — smooth and clean, with only a very low level of pixellation artifacts. The grey-scale and colour linearity also seems particularly good, especially when you're feeding it with S-video or component video.

One of TI's DMDs in closeup, a tad larger than actual size. That centre panel has 480,000 of the microscopic mirrors, tilting back and forth at up to 5000 times per second.

While I looked carefully for any possible colour fringeing on rapidly moving subjects, caused by the rotating filter wheel, I must confess I really couldn't find any. So in terms of video image quality, the LT84 really is an excellent performer.

How about acoustic noise level? This is an almost universal drawback of today's video projectors from the home theatre viewpoint, largely because they're designed primarily for presentation work. And sad to say, the LT84 is no exception. Although there's a bit less noise than usual from its two small cooling fans, there's also a 'whine' of somewhat higher pitch — which I can only assume comes from the filter wheel motor. So as with many other projectors, noise is probably the LT84's main drawback for home theatre use — especially as the short focal length of the lens means that it generally can't be placed at the back of the room.

And finally, what about the bottom line — price? Again like most projectors that's still a bit too high for many of us, in terms of stretching our home theatre budget. The quoted RRP is a somewhat daunting $10,995, although you might be able to find a dealer willing to shave this down by a grand or so.

Wouldn't it be great if NEC came up with a stripped-down 'home theatre only' version of the LT84, without all of the bells and whistles for computer/presentation work, and say a longer focal length lens? It could even be a bit bigger, to allow easier ventilation and noise muffling. Now that would *really* appeal to home theatre enthusiasts, especially if the price was significantly lower! ❖

NEC LT84 DLP Projector

A very light and compact multimedia projector with 800 x 600 native resolution and 700 lumens of output.

Good Points: Excellent 'film like' image quality on video, thanks to the use of Texas Instruments' DLP technology; component video inputs, as well as S-video and composite video; able to capture images to PC card and give free-standing 'slide show' presentations.

Weak Points: Fan and filter wheel noise a little too high for home theatre work, bearing in mind the lens focal length.

RRP: $10,995

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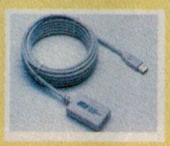

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Panasonic's DVD-A360A

The DVD-A360A is a new addition to Panasonic's range of DVD players, and has become their 'deluxe' model. It offers a number of advantages over the A160A standard model, including built-in 5.1 channel decoding for both Dolby Digital and DTS surround sound, component video outputs and the ability to 'fine tune' the video output for different types of display.

by Jim Rowe

A VERY FEW OF the first generation of DVD players offered such niceties as built-in multichannel surround decoding or component video outputs. Most offered just two-channel 'mixdown stereo' analog sound outputs, together with composite and perhaps S-video outputs. Which was OK for a while, because often we didn't have the requisite multi-channel amps and speaker systems to take advantage of that 5.1 channel sound, or a TV set capable of accepting component video either.

The technology continues to push ahead, though, and now the manufacturers seem to be able to provide many of these extra 'bells and whistles' as a matter of course — at prices lower than before. That's the kind of development that most of us are fairly happy to see, surely!

The new Panasonic DVD-A360A is an excellent example. Among its many new 'extras' is full six ('5.1') channel surround decoding, not just for the Dolby Digital tracks found on most DVDs, but also for DTS (Digital Theater System) tracks as well. While there are no discs with DTS tracks available in our region at present, there probably will be before long — and with a player like the DVD-A360A, you'll be ready for them...

With the decoding built into the player, all you need for full-strength digital surround sound is an amplifier or receiver setup with the requisite number of channels, and of course the appropriate speakers.

Another welcome feature of the DVD-A360A is *component video* outputs. These go one better than the separate luminance (Y) and chrominance (C) signals found in S-video outputs, by delivering the colour information itself in the two separate components (R-Y and B-Y) used to encode it on the DVD. As a result you have the potential for the highest possible image quality, without any of the moire patterning and other artifacts than can creep in when the components are combined.

Of course in order to take advantage of this feature, you'll need a TV set or projector fitted with component video inputs. But many of the new sets and projectors do have these, so it should be less and less of a problem as time goes on. In any case the DVD-A360A provides standard composite video and S-video outputs as well, for those whose current set doesn't have component video inputs. And with it, you're ready to upgrade as soon as you *do* buy new set.

Still on the subject of image quality, another nice feature of the DVD-A360A is a Monitor Selector function, whereby the player can be made to adjust its key picture parameters to give optimum performance on either a standard CRT-type TV, a CRT-type video projector, an LCD projector or a rear-projection TV. This is very handy, because each of these display devices has slightly different requirements in terms of brightness, contrast, gamma and sharpness settings; finding the best 'recipe' can be fiddly and time consuming when you have to do it manually.

In addition, the player also gives you a function called Digital Cinema Mode, whereby the noise filtering and equalisation used for image replay can be optimised for 'movie' software, at the touch of a switch. There's also Digital Picture Mode, whereby you can select from one of three other filtering/equalisation recipes (Normal/Fine/Soft), and a User mode where you can set your own preferences in terms of contrast, brightness, colour hue and equalisation. It's very flexible.

Needless to say it uses 10-bit digital video processing for optimum linearity, together with a 10-bit video DAC.

Not surprisingly the DVD-A360A also offers many of the other features found on the newer players. For example there's a Virtual Surround Sound function, for producing a synthesised surround sound effect when you're listening via a stereo TV's speakers, or using stereo headphones for late-night viewing. There's also a Dialogue Enhancer, to boost the centre front channel's volume when its dialogue track is tending to be 'swamped' by music or effects on the other channels.

Other features include five-speed disc scanning (up to 100x), 96kHz/24-bit audio DACs, PAL/NTSC compatibility, both optical and coaxial digital bitstream sound output for external decoding (of MPEG2 surround, for example), improved still picture display, frame advance in both forward and reverse, and an enhanced version of Panasonic's familiar and very functional on-screen graphical user interface (GUI).

The rated horizontal resolution of the DVD-A360A is better than 500 lines, with a video S/N ration of 65dB. Rated audio S/N ratio is 115dB, with dynamic range figures of 106dB and 100dB for 24-bit LPCM and 16-bit CDs respectively.

All this is housed in a clean and functional light grey case, measuring a fairly standard 430 x 268 x 94mm and weighing 3.3kg. The IR remote is a fairly standard paddle-shaped affair, with a recessed joystick/select button that like the one on the new Pioneer player is slightly fiddly to use with typical adult fingers. There's one nice feature, though: 26 of the buttons that you don't use very often are on the lower 'handle' part of the control, hidden behind a slide-down cover. (Nine of these buttons seem to be for karaoke functions, but I couldn't find reference to them in the user manual.)

By the way unlike some of the other new DVD players we've looked at recently, the DVD-A360A is *not* compatible with CD-R or DVD-R discs. It uses a fixed wavelength laser pickup operating at 665nm.

Trying one out

Panasonic Australia very kindly made a DVD-A360A available to me for a couple of weeks, so I was able to give it a good workout, both with the instruments and in a fairly typical home theatre situation. They actually also sent one of their snazzy LCD video projectors (PT-L557EA) at the same time, so I was able to try the two together. You'll find the projector discussed further in a separate review; suffice to say here that they go together very well, and deliver excellent picture quality.

First up, though, I checked the DVD-A360A using the instruments as a CD player. Here the frequency response measured within +0dB/-0.5dB between 20Hz and 20kHz, and since the response was only about 0.1dB down at 20Hz (the lowest frequency on my test CDs), there's little doubt that it extends down to the rated rolloff frequency of 2Hz. Channel balance measured better than +/-0.1dB over the 20Hz - 20kHz range, which is excellent.

The 'fade to noise' tracks showed very good linearity down to below about -65dB, while the measured level from the 'digital silence' track (indicating usable S/N ratio or dynamic range) was about -103dB — nudging the noise floor of my measurement setup.

The square wave response showed a moderate level of symmetrical ringing, of about 7% peak, and there was about 16% peak ringing on the impulse response.

In short, the player's CD audio performance can best be described as 'above average', but not quite in the same league as top-end players like the Denon DVD-5000 player reviewed a few months ago.

With the measurements done, I then used the DVD-A360A both to listen to my reference CDs and to watch/listen to a couple of recently released DVD movies, to get a good idea of its subjective performance. The results were generally very impressive, too.

The sound from audio CDs was very clean, with good highs, warm bass and clean stereo imaging. No problems here, then; the DVD-A360A makes a very high quality CD player.

Next I tried watching movie DVDs, not only with it hooked up to Panasonic's PT-L557EA LCD projector, but also with my Sony 68cm CRT receiver — in both cases using the S-video output. The image quality was excellent in both cases, especially after I had taken advantage of the player's Monitor Select mode to optimise the video processing. The image was clean, sharp and steady, without obvious ringing or other processing nasties, and there was virtually no Moire patterning visible on the 'moving Fresnel zone plate' test pattern from the Video Essentials test disc.

Checking the video performance using the same disc and a scope, I found the response had a slight peak at around 3MHz, but was otherwise virtually flat to 5MHz. The square wave performance showed only modest ringing: around 7%. A very good result.

The sound quality was excellent from Dolby Digital 5.1 tracks too, using the built-in surround decoder. By the way this includes a pink noise test signal generator, so it's easy to set up your sound system using the friendly on-screen GUI.

As luck would have it, the review sample of NEC's new LT84 DLP-based video projector also turned up just before I had to pack up the DVD-A360A to send it back. You'll find this projector reviewed elsewhere, but as the LT84 has component video inputs, it gave me a great opportunity to try out this aspect of the DVD-A360A as well. So I quickly made up the necessary cable, and watched another movie disc that very night.

The results were very impressive indeed, thanks both to the component video connection and the particularly clean display from the LT84's 480,000-micromirror imaging system. In fact the image was very 'film like', and not far behind that in our local cinema multiplex.

As a DVD player, then, the DVD-A360A has well above-average performance and pretty well all of the features you're likely to need for a long while — except perhaps CD-R/DVD-R compatibility.

My only small criticisms are that the sample unit seemed to produce a slightly longer and more noticeable 'pause' than others I've tried at the layer-change of some DVDs, and also very occasionally the picture decoding seemed to trip up for a split second — in a non-reproducible way.

Overall, though, Panasonic's engineers seem to have done a very nice job with the DVD-A360A. For the quoted RRP of $1099 it certainly delivers good value for money. ❖

Panasonic DVD-A360A

A competitively priced 'deluxe' DVD/CD player offering features such as component video outputs and full Dolby Digital/DTS surround sound decoding.

Good Points: Very good sound and picture quality; nice extras like 'Monitor Select', 'Cinema Mode' and 'Dialogue Enhancer' functions.

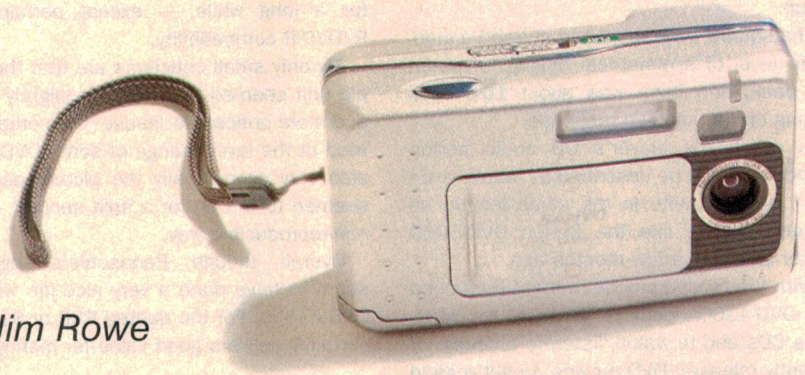
Weak Points: Not compatible with CD-R or DVD-R discs.

RRP: $1099

Available: Panasonic dealers. For more information call Panasonic's Customer Care line on 132 600.

Sanyo's PLC-SU10E Multimedia Projector

Equally suited for home theatre use as well as PC-based data presentations, the compact Sanyo PLC-SU10E provides 800 x 600 image resolution with a very respectable 600 lumens of light output. Currently it's also being offered together with one of Sanyo's digital still/video clip cameras, the VPC-X250EX, as a 'presentation pair'.



by Jim Rowe

ALTHOUGH LCD VIDEO projectors are still seen by many as a business tool for sales and data presentations, driven by a PC or laptop, they're also quite suitable for home theatre use. Most of them have inputs for both composite and S-video, and they're usually capable of throwing up a big, bright image — especially in the relatively low lighting levels present in most home theatres.

It's true that they usually carry a price tag rather higher than CRT-based rear projection sets, and that their picture tends to be a little more 'pixilated'. But on the positive side, they're generally fairly small and unobtrusive, and don't tend to dominate the room like a rear projection set. So if you want a really BIG picture for maximum visual impact in your home theatre, an LCD projector is actually well worth considering.

The PLC-SU10E seems to be the lowest-cost model in Sanyo's current projector range which is suited for this kind of use, even though many of its features and facilities are clearly designed for data presentations. For example it accepts computer graphics from either Macs or PCs, at resolutions up to 1024 x 768 pixels — although this mode is actually compressed and displayed at 800 x 600, the projector's basic resolution. A standard VGA cable is supplied, along with a Mac/VGA adaptor with a DIP switch giving various resolution options.

It also has a PC card slot, and comes complete with an adaptor for the smaller SmartMedia memory cards, so it can be used to give self-contained 'electronic slide show' presentations directly from images stored in a PC card or SmartMedia card. There's even an accompanying MCI (Media Card Imager) program to let you download presentation images either directly to PC/SmartMedia card (if your PC/laptop has the right card slot), or down to the card in the projector's slot, via the MCI serial cable which is supplied as well.

As if that's not enough, the projector's IR remote can also be used as a wireless mouse during direct computer-driven operation, once its 'control port' is hooked up to the computer via one of the supplied serial cables.

So there's no argument that the PLC-SU10E is well suited for data presentations. But how about its suitability for home theatre use? There are no major limitations here, either. While its light output of 600 lumens is not as high as some of the more expensive models, it's still plenty to produce satisfyingly bright images of the size needed for a typical home theatre (say 1.5 - 2m diagonally), and at the usual fairly low ambient lighting levels.

The projector uses three 0.9" TFT (thin-film transistor) active-matrix LCD panels, with a 120W UHP lamp and a polarised beam splitter system. The projector lens is a 36 - 57.6mm zoom lens with motorised zoom and focus, and an aperture varying between f/2.3 and f/3.0. This gives a diagonal picture sizes varying between 20" and 300", over projection distances of between 1.1m and 11.5m. Rated contrast ratio is 250:1.

The resolution level of 800 x 600 pixels is more than enough to do full justice to video from DVD or Laserdisc players, too — let alone off-air/pay TV signals or VHS tape. The rated horizontal resolution is 750 TV lines, and the projector does provide an S-video input as well as a composite input. There's

Above: The VPC-250EX camera stores its images on SmartMedia cards; these are very thin and can store up to 32MB (A 4MB card is supplied with the camera). After you've taken some shots, the card can be slipped out of the camera, into a PC card adaptor and then into the projector, for an instant slide show.

even an inbuilt 1W mono audio amp and tiny speaker, although clearly you wouldn't want to use these instead of your home theatre's surround sound system.

On the video side the PLC-SU10E accepts standard PAL, NTSC or Secam format signals, plus NTSC4.43 if required. So there's no problems showing movies from NTSC Laserdiscs or DVDs, for example, as well as PAL.

I should also mention that like many LCD projectors, the PLC-SU10E has its optical system set up so that the projection axis is raked upwards by about 15°, to allow the projector to be set on a relatively low horizontal surface. At the same time it's set to produce a squared-up and evenly focussed picture on a vertical screen — i.e., without keystoning or similar problems. It does have adjustable feet at the front, though, giving about 2° of picture vertical adjustment.

The projector itself is fairly compact — 315 x 215 x 109mm — and weighs in at a modest 3.9kg.

Companion camera

To add to the appeal of the PLC-SU10E, for both business and home theatre users, Sanyo is currently offering it complete with one of their digital still/video clip cameras: the VPC-X250EX. This is a very compact little unit (106 x 61 x 35mm) with a 1/3" 350,000-pixel CCD, offering the ability to take stills at either 640 x 480 or 320 x 240 resolution, or video clips at either 320 x 240 or 160 x 120 resolution (max speed/length 10fps/5s and 15fps/10s respectively, including sound).

Because the camera uses SmartMedia memory cards for its image storage, and also comes with direct video and audio outputs (cable supplied) this gives the combination some interesting capabilities. For example you can hook the camera straight up to the projector via the video link cable, and use the combination to present a 'slide show' of the pics you've taken with the camera — immediately, and without going near a computer.

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You can also achieve virtually the same result by opening the camera, taking out the SmartMedia card, slipping it into the PC card adaptor, and plugging them both into the projector.

Needless to say you can also use the video link cable to show the video clips you've taken with the camera, although their very modest resolution won't look all that good when blown up on the big screen. This aspect of the camera is mainly intended for taking clips for your website, or e-mailing them to your relatives overseas.

Overall though, the camera makes a handy accessory for the projector, and I imagine the combination might be very useful for people like real estate agents.

Trying them out

I mainly tried out the sample PLC-SU10E projector in a home theatre situation, showing video from either an NTSC Laserdisc player or a couple of different DVD players — playing a variety of familiar and new software. I did hook it up as well to a PC running Windows 98, though, and tried both 1024 x 768 and 800 x 600 graphics to see how it performed.

Basically it performed very nicely too, in all of these situations. My screen is about 1.7m diagonally, and at that size the PLC-SU10E gives pictures of very acceptable brightness, focus and contrast range. The resolution also seems more than adequate for achieving close-to-optimum results from DVD or Laserdisc software, although if it had component video inputs this might allow a small improvement.

As with many LCD projectors the cooling fan is a bit noisy, though, and this is probably the PLC-SU10E's biggest single shortcoming for home theatre use. It wouldn't be as much of a problem if the zoom lens had a longer range or focal length, so the projector could be placed right at the back of the room without making the picture grow too large. As it is, though, it has to be placed either in front of you or immediately behind you, where the noise tends to intrude in the 'quiet scenes'.

I was also interested in trying out the projector with the VPC-X250EX camera, using both the video cable and 'card swapping'. Both approaches seem to work well, although the video cable is a bit more convenient. Getting the tiny SmartMedia card into and out of the camera is much more fiddly than simply plugging in a cable at both ends.

To be honest, though, the camera's 640 x 480 'VGA' resolution really isn't good enough to have the images enlarged very far with the projector. Also the camera's battery current drain seems to be fairly high, even by digital camera standards. A charged pair of NiMH cells seems to last only an hour or so — so for many applications you'd really need two pairs. (A charger is included.)

Overall, though, the Sanyo PLC-SU10E projector seems quite well suited for home theatre use (apart from that fan noise), and the little VPC-X250EX camera makes a handy companion for it. At the quoted RRP of $8995 for the pair, they seem reasonably good value. ❖

Sanyo PLC-SU10E

An LCD video/data projector offering 600 lumens of output, 800 x 600 resolution and the ability to display from images stored in a PC card or SmartMedia card.

Good Points: Motorised zoom and focus; good light output and resolution for home theatre use; and currently, its availability complete with a VPC-X250EX digital still/video clip camera.

Weak Points: Fan noise a bit intrusive for home theatre use. Component video inputs would be nice, plus a zoom lens with longer range or focal length. The camera's resolution is fairly low.

RRP: $8995 complete with camera.

Available: Sanyo Australia, 211 Walters Road, Arndell Park, Blacktown 2148; phone (02) 8825 2822.

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by Jim Rowe

Panasonic's bright new projector

Combining a resolution of 800 x 600 pixels with a very impressive light output of 1500 lumens, the PT-L557E is roughly in the middle of Panasonic's multimedia projector range in terms of price. If your budget allows, this would make it a good choice for home theatre use as well as business presentations.

ALTHOUGH IT'S DESCRIBED in Panasonic's sales literature as an 'Ultra Portable', the PT-L557E is neither the smallest nor the lightest LCD projector around (or even in the Panasonic range). By the same token it's still *reasonably* compact and portable; the sturdy magnesium alloy case measures 336 x 263 x 124mm, and weighs 6.2kg.

Perhaps the main feature of the projector from a home theatre point of view is its combination of high light output, uniformity of illumination and image resolution. At 1500 ANSI lumens, the light output is very impressive — double that of many other models, in fact. Coupled with a rated centre-to-corner illumination ratio of 95% and a contrast ratio of 200:1, the projector is therefore capable of producing a very impressive 'big screen' image. This has been achieved by using 200W UHM lamp, a trio of husky 1.3" polysilicon LCD panels and an efficient 1.3:1 manual zoom lens with an aperture varying between f/2.5 and f/3.

Along with the high light output, those LCD panels also deliver true SVGA or 800 x 600 pixel resolution. So the projector is quite capable of making the most from high quality video from a DVD or laserdisc player. Needless to say it's also able to do justice to most computer graphics formats, including XGA (1024 x 768 pixels) which it compresses smoothly down to SVGA.

Computer graphics is after all the main intended use for projectors like the PT-L557E; displaying video seems to be almost seen as a 'weekend bonus'. With this in mind two more nice features of the projector are its ability to present a slide show presentation from JPEG images stored on a PC card, and conversely its ability to capture any image you're currently projecting, and save it onto a PC card. The PC card plugs into a slot on the side, just at the rear of the other connectors.

This means not only that you can use the projector to give presentations by itself (i.e., without needing a PC or laptop), but you don't even need a PC card slot in your computer to prepare such a presentation. You can simply run through the program of your choice, feeding the images to the PT-L557E in sequence, and getting it to capture them on the card itself. Very nifty!

The same capture feature can also be used to take screen grabs from video, although you really have to pause the video to do this as the 'write to PC card' operation takes a few seconds.

For direct display of computer graphics the PT-L557E accepts normal analog RGB signals via a standard high density 15-pin D connector, and also provides a 'relay' output from a second socket to run a monitor at the same time. It can cope with a wide range of scan frequencies, from 56.25 - 85.1Hz vertically and 24.83 - 60.24kHz horizontally, and can accept separate or composite H/V sync as well as 'sync on green'. Selection of the correct display mode is automatic.

On the video side, it can accept either composite or S-video via the usual RCA and miniature 4-pin sockets respectively. It does not seem to be able to accept Y/R-Y/B-Y component video. Video formats accepted include NTSC, NTSC 4.43, PAL, PAL-M (PAL 60), PAL-N (PAL 3.58) and Secam. Recognition of these formats is also automatic, but manual setting is also available.

There's a built-in audio amp and speaker, which would normally be used only for business presentation work. The amp has a rated output of 1.5W and drives a 70 x 40mm elliptical speaker. There's also a line-level audio output to hook the projector up to an external audio system.

The PT-L557E comes with a compact and

Panasonic PT-L557E multimedia projector

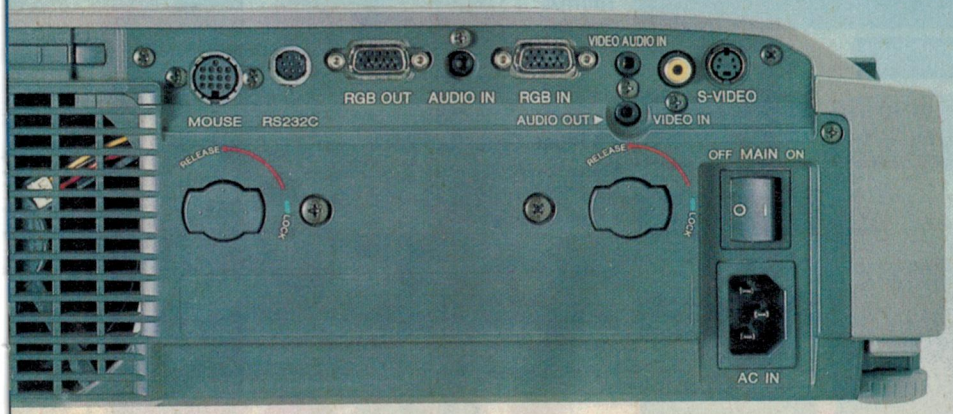
A compact but solidly made projector with 800 x 600 resolution and 1500 ANSI lumens of light output.

Good Points: Very impressive light output and uniformity of image illumination; good resolution for home theatre use; handy built-in target image for focus setup; ability to present 'slide shows' from images captured on PC card.

Weak Points: Fan noise is a bit high; component video inputs would allow optimum image quality from DVDs; a lens of longer focal length might also be an advantage for home theatre.

RRP: $13,999

Available: Specialist computer and A-V dealers. For more information call Panasonic Customer Care on 132 600.



easy to hold IR remote, which includes a red laser pointer and can also double as a wireless computer mouse. The remote can mute the sound, adjust the volume, turn both picture and sound on and off simultaneously, 'freeze' the picture, select one of a number of saved 'display mode' image parameter combinations, select the input source to be displayed and of course turn the projector on and off.

The projector comes with quite a selection of cables to hook it up to both computers and video sources. There's also a VGA graphics adaptor for Macs, two different mains cords (it will run from 100 - 240V), a lens cap, a 3.5" floppy disc with Windows 95/98 software to allow saving and viewing of JPEG images on a PC card (for computers with a PCMCIA Type II slot), and a 47-page user manual.

Oh, by the way — the PT-L557E can be used either sitting on a table or floor stand, or hanging from the ceiling. In fact it can be set to flip its projected image horizontally as well as vertically, for rear projection applications as well.

Trying it out

Thanks to the marketing people at Panasonic Australia I was able to try out a sample PT-L557E for a couple of weeks. As they'd also made available one of their new DVD-A360A DVD players (reviewed separately), that was one of the video sources I used to try it out. I also tried it with video from an NTSC laserdisc player and my own DVD player.

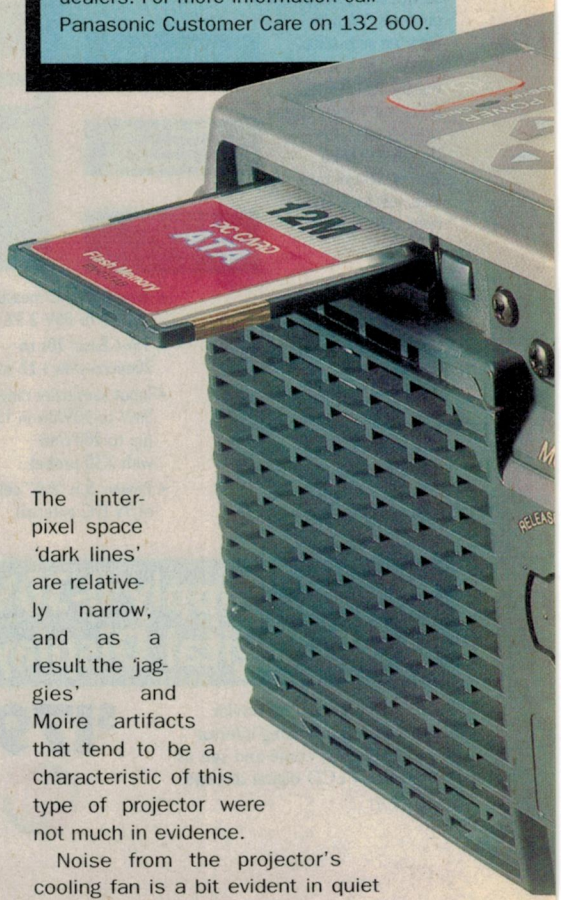
Although I was mainly interested in evaluating the projector's performance for home theatre use, I did also try hooking it up to a computer to see how it handles that type of signal. Not surprisingly it did so with great aplomb, throwing up very bright, crisp and impressive images from both SVGA and XGA graphics mode signals. The compression used for the higher-res mode is quite smooth, and little seems to be lost.

The capture to PC card function also seemed to work very nicely, along with the complementary process or showing the 'slides' you've saved on the card. A nice feature is that you can program a presentation for automatic cycling, where each image is shown for 5, 10, 30, 60 or 120 seconds.

There's another nice feature that you notice as soon as you turn the projector on: in the absence of video input, it automatically throws up a target pattern to assist you in setting up correct focus. A very useful function, and very thoughtful of Panasonic's designers to include it.

But how did the projector go with video, for home theatre type use? Very nicely indeed, in the main. At the sort of picture size typically used (1.5 - 2m diagonal), the image is very bright indeed, and exceptionally even in illumination right out to the corners. The lens also seems to have very low astigmatism, so the focusing is very uniform too. The vertical raking of the projection axis is about 12°, which allows the box itself to be mounted on a fairly low table or stand without producing keystone distortion.

The picture quality was of a very high standard, from both laserdisc (analog composite NTSC) and DVD (digital S-video PAL). In fact my impression was that you could hardly do better, especially from an LCD type projector.



The inter-pixel space 'dark lines' are relatively narrow, and as a result the 'jaggies' and Moire artifacts that tend to be a characteristic of this type of projector were not much in evidence.

Noise from the projector's cooling fan is a bit evident in quiet passages, and as with many of these projectors it's hard to do much about this as the focal length range of the projection lens is a bit too short (45 - 59mm) to allow it to be moved right to the back of the room (without the picture growing enormous). In fact this would be my only real criticism of the projector for home theatre use, apart from its lack of component video inputs.

If it's a big, clean and really bright picture you want though, and the cost isn't a problem, this one would make a good choice. ❖

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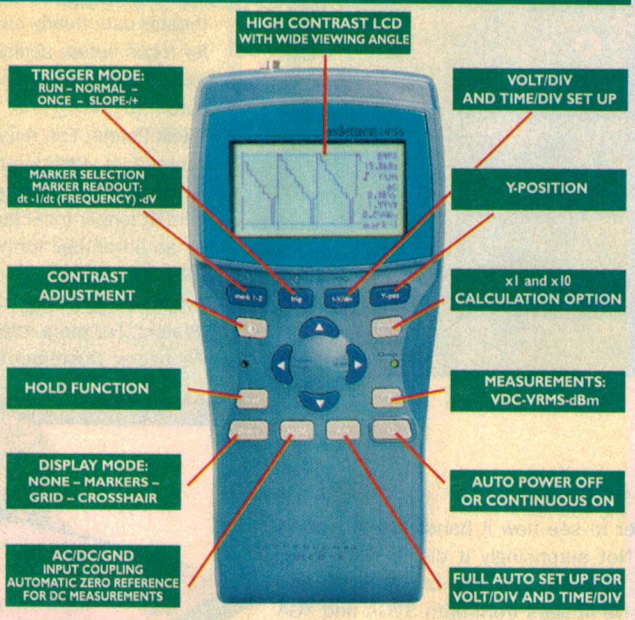

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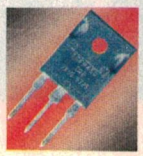

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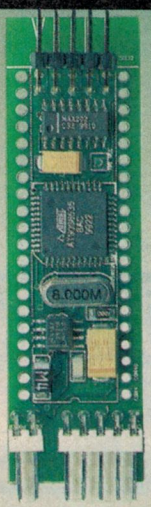

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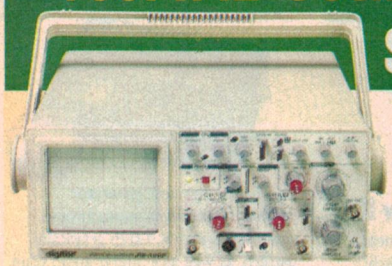

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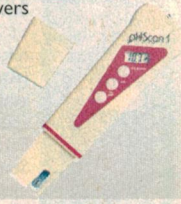

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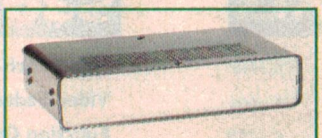

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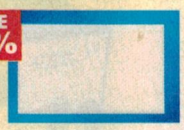

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Single gang, white.
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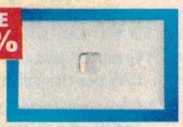

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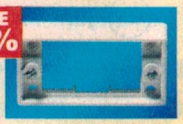

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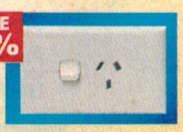

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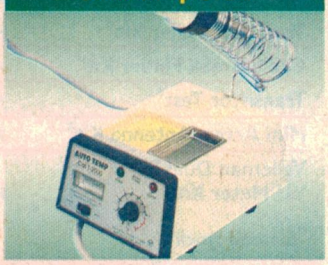

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That's where you go!

Phone Call Screener

The phone rings late at night, you imagine all sorts of scenarios and scramble out of bed — sorry wrong number! This inexpensive project gets around this and similar situations, because you can give friends and relatives a four digit code they can enter from their phone keypad to get your attention. By entering the code, the caller sets off an audible indication that you should pick up the phone.

by Peter Phillips

This inexpensive project lets you screen incoming phone calls. Use it to deal with nuisance or harassing phone calls, in which genuine callers enter a code to set off an audible tone to get your attention.

These days most phones have a DTMF (dual tone multiple frequency) keypad, in which keypad information is sent over the phone lines as a pair of audible tones, rather than a number of pulses (as in the decadic system). In the DTMF system, each digit is represented by a combination of two audio frequencies which, in most phones, you hear each time you press a key. This system has revolutionised phone usage, with bill payments and all kinds of activities now able to be done from a DTMF keypad. This project, from Oatley Electronics, is an application of DTMF technology, and although a simple idea, it has the capacity to screen unwanted callers, nuisance calls and so on.

In principle, the device picks up DTMF information via an electret microphone placed near the speaker of your answering machine. This means the project does not connect directly to your phone lines, and therefore is perfectly legal. Your answering machine message might say something to the effect of leave a message and/or enter a four digit personal code. If the caller enters the correct code, a speaker emits an audible tone, alerting you that someone privy to your code is trying to contact you.

For example, this project would be especially useful if you get a lot of nuisance or harassing phone calls, and the solution (if any) offered by your telecommunications provider (Telstra, Optus etc) is impractical for your situation. Simply give the four digit code to those likely to phone you so you know whether a call is friendly, or likely to be a nuisance call. As well, you can turn off the phone ringer altogether and let the audible tone alert you instead. This allows you to ignore the nuisance calls entirely, yet still answer the phone when someone who knows the code is calling.

The project as presented has the speaker built in, but you could run extension wires and have the speaker in your garage or workshop. Let the answering machine take all incoming calls, except those that set off the audible tone, which you then intercept by going to the phone and taking the call. This way you don't have to drop what you are doing everytime the phone rings, only when you know the call is from someone who has the code. There are no doubt many other uses you might think of, but there is one other application that might escape your attention...

Combination lock

As already mentioned, mobile phones generally emit the key's DTMF tones when you press that key. In fact this is the simplest way to check if the project is working. But it also means you can use the project as a combination lock, with a mobile phone as the key. All you do is connect the project to a door strike solenoid, mount the microphone so it's out of sight, then press the buttons on your mobile phone to trigger the door strike.

To allow for this, the circuit includes a driver for an external relay, door strike or whatever device you might want. Furthermore, the project can be powered from a 12V battery, and the circuit even includes a low voltage indicator so you know when the battery needs recharging.

Of course, the unit can also be powered from the mains, but in the case of a combination lock, you'll probably want to use battery power. There are also LED indicators that show the status of the circuit as a code is being applied, but in the case of a combination lock, you'll probably keep these hidden.

Now that you have some idea of its uses, let's look at the circuit to see how it all works.

Circuit description

The input is via an electret microphone, which is placed near the speaker of the answering machine. When the phone rings, the answering machine will pick up the call, with your message inviting the caller to enter the code. If the caller doesn't know the code, they can leave a message and you aren't interrupted. If the caller knows the code, they can enter it via their phone pad. The DTMF tones from the caller's phone are picked up by the microphone, amplified by the circuit around Q1, and applied to the DTMF decoder IC1.

Pin 12 of IC1 goes high for any valid DTMF tone, triggering the timer around IC2a-c. The output of this timer is from pin 4 (of IC2), which goes high six seconds or so after the

timer is triggered. When this happens, the timer resets itself via diode D4, and a reset signal goes to IC4 and IC5 via D5.

The caller therefore has six seconds to enter the code, although after the timer is reset, the caller can try again. This operation is effectively transparent to the caller, who can try for as long as the phone connection lasts. The answering machine will still let the caller leave a message as normal if you are not there to pick up the call, even if the caller has entered the correct code.

The main purpose of this timer is to reset the rest of the circuit regardless of what has happened before. Otherwise, if a caller has entered part of a code then hung up, it will prevent future callers entering the code. A point to remember is that the caller doesn't get any acoustic feedback, so it's important to make it as easy as possible for the caller to trigger the device and therefore get your attention.

Let's assume the system is set for the code 1-2-3-4. To do this, links are connected between the outputs of IC3 and the inputs to IC4 and IC5, with output 1 connected to digit 1 input, output 2 to digit 2 input and so on. The code you choose is up to you, but it must have four digits, with no digit repeated.

An 'in the know' caller will therefore enter the code 1-2-3-4 when the answering machine has kicked in. As the DTMF code for 1 is received, output 1 from IC3 (a BCD to decimal decoder) goes high, setting the output (pin 1) of IC4a high. This reverse biases D16, removing the low previously applied to the input of IC4b, allowing this IC to respond to the next code, which is this example should be a 2. If this code is received, the output of IC4b goes high, allowing the input of IC5a to respond to the next digit and so on. If the correct code has been entered, after the fourth digit the output of IC5b will go high, triggering the timer around IC6a-b, in turn enabling the tone generator around IC6c-d for around 20 seconds.

As you can see, IC4 and IC5 are connected as basic RS flip flops, with simple diode and resistor gating to make them behave as a storage register. These flip flops are reset at power-on by C5, R13 and D19, and are also reset by the outputs of both timers: from IC2c via D5 and from IC6a through D20. LEDs 3, 4 and 5 show the status of the first three flip flops. There's no need to show what's happening with the fourth flip flop output, as it remains a logic 1 too briefly to light a LED.

The flip flop reset circuit also includes diodes D6-11 and D13-15, which cause a logic 1 reset signal to be applied to IC4 and IC5 when one of the outputs of IC3 goes high. Obviously this is a problem if the code being received is correct, so you need to remove the diodes from the outputs you have selected as the code. In our example, you would remove diodes D6, D10, D7 and D11.

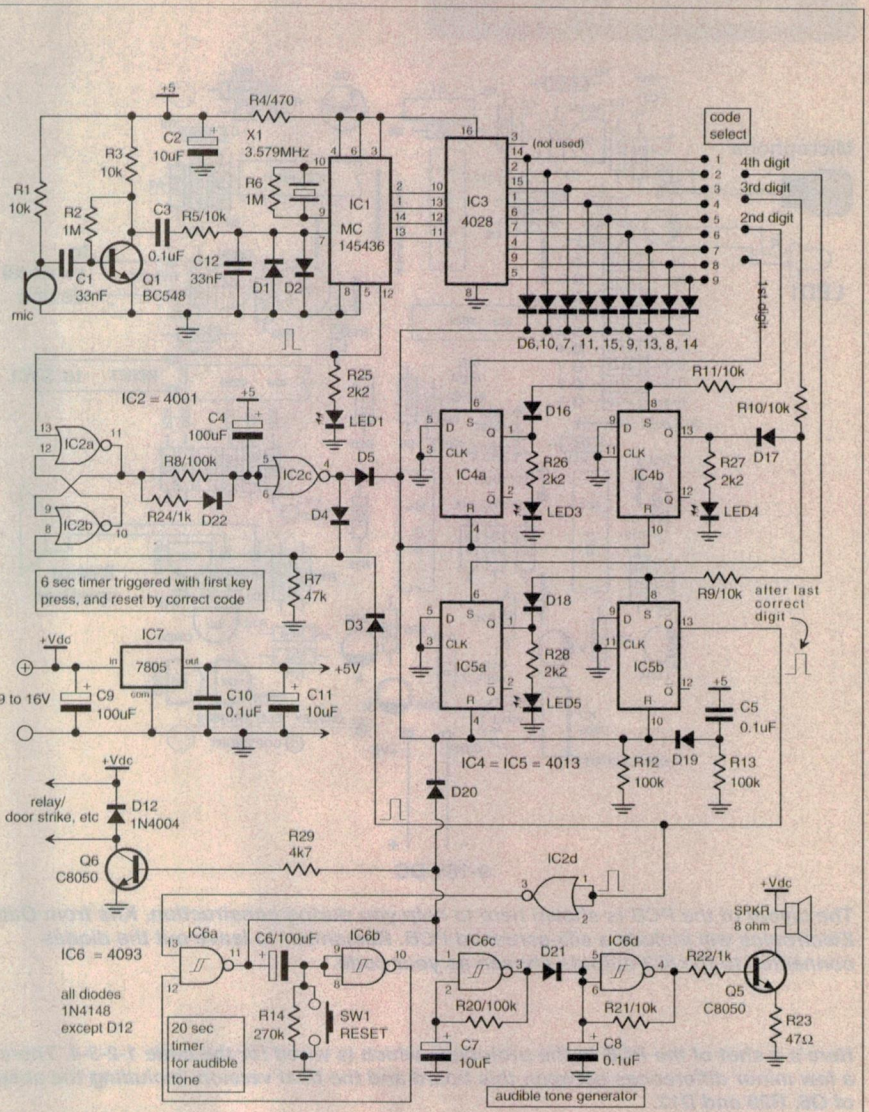


Fig.1: The circuit of the phone screener, in which a DTMF tone is picked up by the microphone, decoded by IC1 and IC3 to appear as a logic 1 at the output of IC3. The selected four digit code will cause the outputs of IC4 and IC5 to become high as each digit is received, with the last digit triggering a timer to set off the tone generator

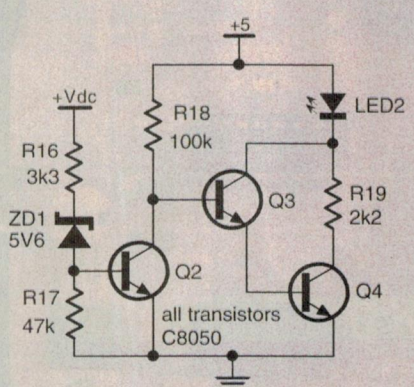
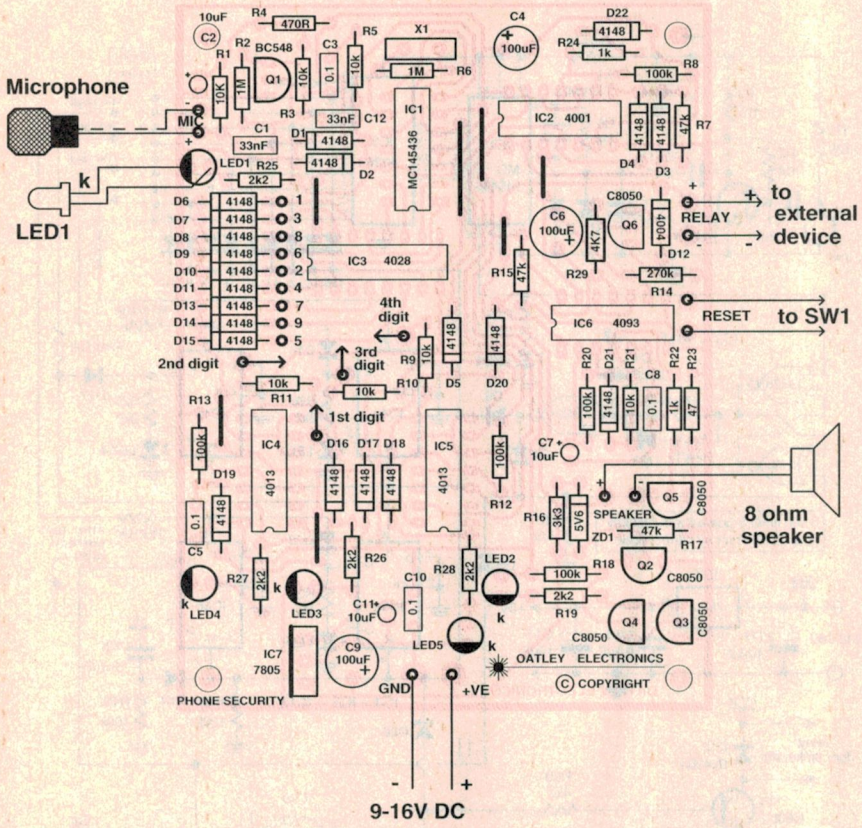
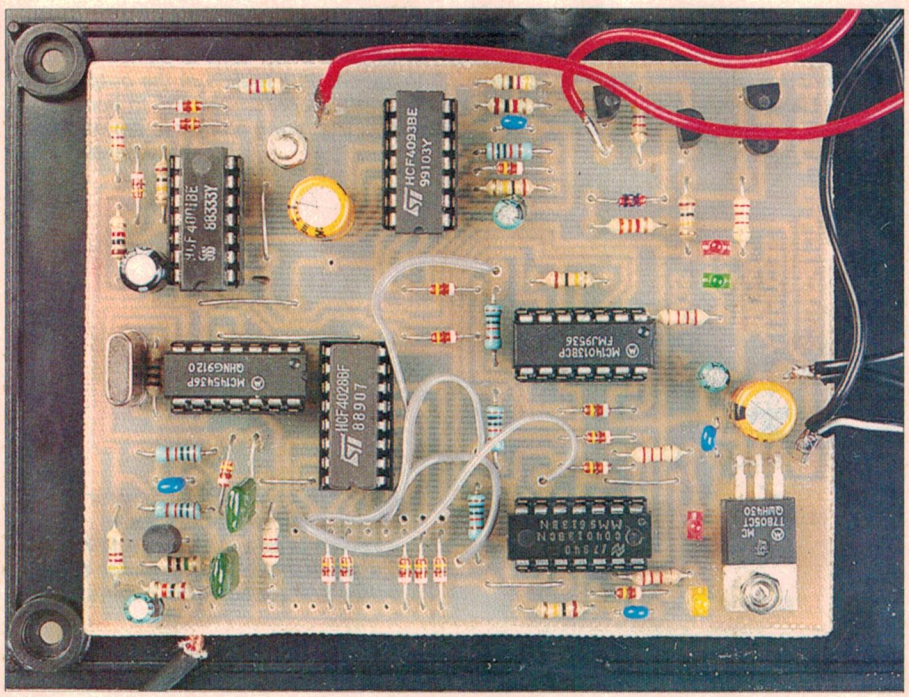


Fig.2: The low voltage indicator circuit, used when the phone screener is powered from a 12V battery. If the DC input voltage falls below 8.5V (or so), LED 2 lights.



The layout of the PCB is shown here to help you during construction. Kits from Oatley Electronics will include a silk-screened PCB. Remember to leave out the diodes connected to the IC3 outputs chosen as your code.

Here's a shot of the PCB in the prototype, which is wired for the code 1-2-3-4. There are a few minor differences between this board and the final version, including the absence of Q6, R29 and D12.



The remaining diodes therefore reset the flip flops each time an incorrect code is entered, allowing the code to be re-entered as often as the caller wants to. However this won't help someone who doesn't know the code, as the only indication for a correct code is you answering the phone. And if someone stumbles on the code, you can change it later. In summary, the flip flops are reset at power up, by any 'non-code' output from IC3, by the six second timer of IC2a-c, and by the 20 second timer around IC6a-b. Pressing SW1 also resets the 20 second timer, which not only resets the flip flops, but disables the tone generator circuit.

The time delay for the six second timer is provided by C4 and R8, with R24 and D22 providing a low resistance discharge path for C4 when pin 11 of IC2 goes high. Similarly, C6 and R14 determine the time delay for the 20 second timer. When its output (pin 11 of IC6a) goes high, it resets the flip flops, enables the tone generator, turns on Q6 and any device driven by Q6.

The tone generator comprises two oscillators, one to produce an audible tone, the other to pulse the tone on and off to give a beep-beep sound, rather than a continual tone. The output of the tone generator is Q5, which directly drives an 8 ohm speaker. The volume of the output is largely determined by the value of R23. To get a higher volume, lower the value of R23.

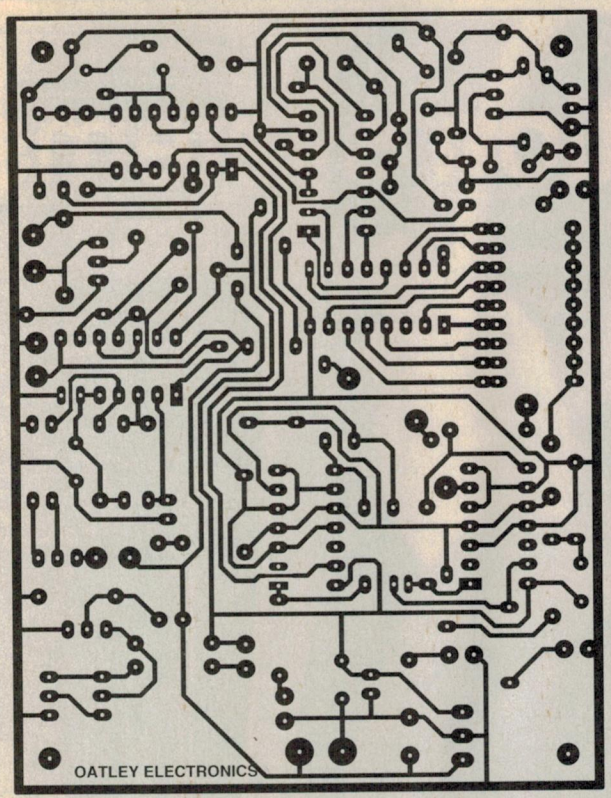
The supply voltage indicator circuit is shown separately, and comprises a zener diode network that connects to the supply voltage. When this voltage drops below 8.6V (measured on the prototype, but could vary due to component tolerances), Q2 switches off, allowing Q3 and Q4 to turn on, lighting LED 2. This circuit is needed only if you intend powering the project from a battery.

The whole circuit is powered from an external DC source, regulated by 5V voltage regulator IC7. Note that the speaker and the device driven by Q6 connect to the external DC source, which can be between 8V and 16V.

Construction

As the photos show, virtually all components mount on one single-sided printed circuit board. It's generally best to start fitting the wire links, resistors and other passive components before mounting the active components. As usual, watch the polarity of the electrolytic capacitors. Fit the crystal last, to minimise the possibility of damaging it while you're fitting everything else.

Before you mount the diodes, first select the four digit code you want to use. Then connect the four links that make up the code, which go between the outputs of IC3 and the inputs to IC4-5. As already explained, leave out the diodes otherwise connected to the four outputs from IC3 you've chosen as the



Here's the pattern of the PCB if you want to make your own. The PCB design is copyright to Oatley Electronics.

code. Connect the diodes for the remaining five outputs however. All diodes in the circuit are the same type, except for D12, and of course ZD1 which is only used if you intend powering the unit from a battery.

All transistors are the same except for Q1 (a BC548), so make sure you identify Q1 before mounting the transistors. Next fit the IC sockets and the voltage regulator, which is intended to lay flat on the PCB, with a mounting screw holding it to the board.

In the prototype, we mounted all LEDs directly on the board except for LED1, which we fitted to the top of the case. However you might want to have all LEDs visible, in which case connect the LEDs to the board with hookup wire, and mount the LEDs on the case.

We drilled a pattern of holes in the case for the speaker grill, and glued the speaker inside the case with epoxy glue. The only other components that mount on the case are the pushbutton and (in the prototype), LED1. These components connect to the PCB with hookup wire. The PCB mounts on the lid of the plastic case, held in place by two nuts and bolts.

Finally, plug in the ICs and solder the crystal in place. Take care not to apply too much heat to the crystal during soldering, to avoid damage. Then check over your work in preparation for testing the device.

Testing

After you feel confident that your wiring is correct, connect a DC supply of between 8V and 16V to the board. The supplied plugpack will probably output around 16V. To test the device you'll need a source of DTMF tones, such as a mobile phone. Holding the phone near the microphone and pressing any key should cause LED1 to flicker. If the key being pressed is the first digit of the code, LED 3 should light, indicating the RS flip flop of IC4a is set to a 1.

Once the first three digits of the code have been entered, LEDs 3, 4 and 5 should be on. Entering the fourth digit should cause the speaker to emit a high pitched beep-beep, not a continual beep. Remember though that you need to enter the code before the six second timer times out, as otherwise it will reset the flip flops and extinguish the LEDs. Pressing SW1 should cause the tone to stop sounding.

Because there are LEDs in all important parts of the circuit, you should find it easy to troubleshoot with nothing more than a multimeter. If LED 1 is not responding to a DTMF tone, check the circuit up to and including IC1. If LED 1 is pulsing, but LEDs 3 to 5 are not coming on, check the circuit after IC3, up to IC6. Make sure the flip flop reset line (pins 4 and 10 of IC4 and IC5) is at zero volts, except under reset conditions.

The final test is to see if it works with your answering machine. The placement of the microphone is not critical, but the closer the better. Then use any DTMF phone to ring your answering machine. Once your greeting message has run its course, enter the four digit code, and if all is working properly, the speaker will sound.

Putting it to use

As already explained, there are two different uses for this project: to screen phone calls or as a combination lock. How you set it up to screen phone calls will depend on your needs. You would probably want to leave the device handy to the phone, so you can silence its tone by pressing the pushbutton when you go to answer the phone. As well, you'll need to power the circuit, either from a 12V battery or directly from the mains, via a 12V plugpack.

When used as a combination lock, the device being operated connects across D12. Typically this would be a relay, which in turn operates a heavy current device like an electric door strike. The whole thing would need to be hidden and protected from the weather, with the microphone located so you can easily enter the code from a mobile phone.❖

Parts list

esistors

All resistors	1/4W
R1,3,5,9, 10,11,21	10k
R2,6	1M
R4	470 ohms
R7,17	47k
R8,12,13, 18,20	100k
R14	270k
R16	3k3
R19,25-28	2k2
R22,24	1k
R23	47 ohm
R29	4k7

Capacitors

C1,12	33nF polyester
C2,7,11	10uF 25V electrolytic
C3,5,8,10	0.1uF monolithic
C4,6,9	100uF 35V electrolytic

Semiconductors

IC1	MC145436 DTMF decoder
IC2	4001 quad NOR gate
IC3	4028 BCD to decimal decoder
IC4,5	4013 dual D flip flop
IC6	4093 quad Schmitt NAND
IC7	7805 5V voltage reg
Q1	BC548 NPN transistor
Q3-6	C8050 NPN transistor (or equiv.)
D1-11,13-21	1N4148 signal diodes
D12	1N4004 power diode
ZD1	5.6V 330mW zener diode
LED1-5	5mm LEDs to suit

Miscellaneous

Electret microphone and lead; 3.579MHz crystal; 8 ohm miniature speaker; normally open single pole pushbutton; 4 x 14 pin IC sockets; 1 x 16 pin IC socket; 12V DC 400mA plugpack; plastic case 160 x 95 x 50mm; hookup wire, tinned copper wire; 2 x 3mm nuts and bolts.

NOTE:
A kit of parts for this project is available from Oatley Electronics, PO Box 89, Oatley NSW 2223. Phone (02) 9584 3563, fax (02) 9584 3561, email: oatley@world.net.
PCB and all on-board components and wired unidirectional microphone: $30
Plastic box, pushbutton, plugpack, label and speaker: $12. Post and pack $6.

Vehicle Navigation systems

With modern vehicle navigation systems it is quite possible for your car to drive itself around — in fact it is quite possible that the car has a better sense of direction than the driver... In this article, Ross Bannatyne looks at the basic principles of car navigation, and the technologies involved.

by Ross Bannatyne
(Motorola, Transportation Systems Group)

Vehicle navigation systems are set to become the next major growth area in automobile electronics, with an estimated fifty million new vehicles to be fitted with such systems in the next five years.

The sudden growth in navigation systems is due to two main factors. The first is that the integration and networking of vehicular systems has resulted in more useful purposes for navigation; until the explosion of electronics in automobiles occurred, such systems were regarded as having limited value to the driver.

The second reason is that the costs of such systems are being driven down considerably. Driver information systems are now an appealing market for many types of businesses including PC manufacturers, car radio manufacturers, Global Positioning System (GPS) vendors, dashboard suppliers, cellular phone manufacturers and many others. This competition has also, predictably, led to reduced prices.

Navigation systems now offer features that extend the basic navigation function, and can address areas such as driver and vehicle safety. Modern navigation systems can be integrated with communications networks to provide emergency calling systems.

If for example, an airbag is triggered, the system can automatically contact the appropriate emergency services with details of the vehicle's location. Similarly, the navigation system can be used to provide exact location details in the event that the host vehicle requires roadside assistance, perhaps deep in the outback.

Another feature of modern GPS-based navigation systems is a vehicle location tracking system. Using signals which are derived from GPS, It is possible to track the exact location of vehicles for the purposes of fleet management or to facilitate stolen vehicle recovery.

Basic technologies

There are three important basic technologies which modern navigation systems use: GPS, map matching with route guidance, and mobile data communications.

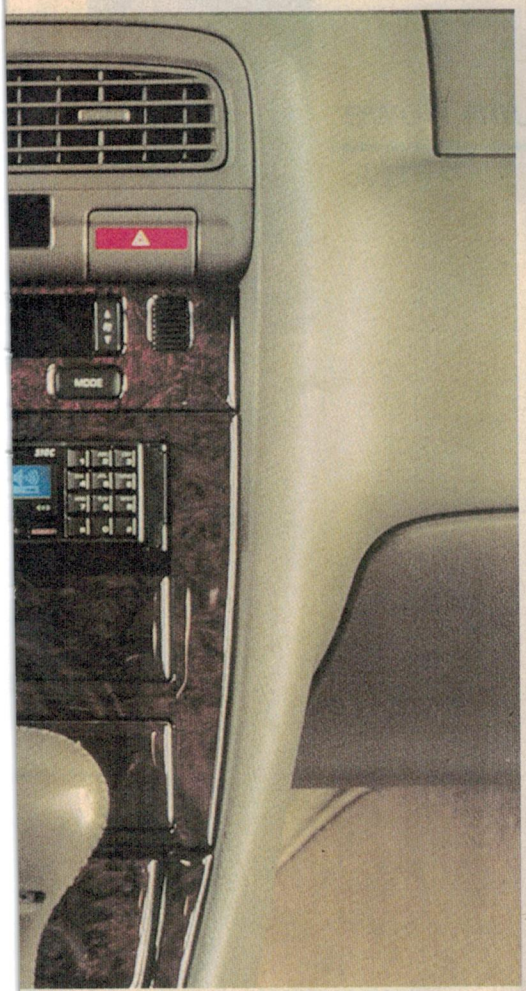
The first basic technology is GPS. When a GPS signal is available, the navigation system uses this information as its main source to determine the exact location of the vehicle. GPS provides absolute positioning, but unfortunately the signal can blocked by buildings, bridges or foliage.

Today in the United States, the signal available from GPS satellites is artificially degraded to limit the accuracy to the nearest 100m. This is known as 'selective availability' and has been a requirement of the Department of Defense. Selective availability will be disabled in the near future in order to provide more accurate GPS data for commercial users.

In order to improve upon the limited accuracy of these selective availability signals, many navigation systems use a technique called *differential GPS* which involves analyzing the signals from several satellite sources. When a GPS signal is not available, the system uses data gathered from vehicle inertial sensors to track vehicle location. The available vehicle location information is then used to perform a 'Dead Reckoning' measurement.

Dead reckoning is a process in which the vehicle's exact location is calculated by integrating measured increments of the distance and direction of travel relative to previous known positions. The distance and direction data is obtained from on-board inertial sensors.

The second basic technology which navigation systems use is map matching with route guidance. A CD-ROM is available for the geographical area in which the driver is located, and it contains precise details of the road network represented as a digitized image



Clarion's AutoPC is an in-dash personal assistant with navigation and car audio features all controlled by voice commands. Er, so why all the buttons then?

(usually produced from an aerial photograph), in which an X-Y grid is superimposed.

Various attributes of the road network are usually also stored on the database, including street names and roadway classifications. The system then uses the vehicle's position, (determined by dead reckoning), to determine the position of the vehicle with respect to the map's database. This tells the system where about on the road network the vehicle is located.

Additional information, such as the location of hotels, restaurants, parking and emergency services is also usually included on the database as well.

Vehicle navigation systems have improved because of a third important technology: on-board cellular communications. This provides the on-board navigation system with the ability to receive real-time information from the outside world, along with the ability to transmit data such as emergency signals.

Early navigation systems did not use GPS or cellular communications. Dead reckoning was derived solely from the inertial sensor data. Such systems have been around since the late 1980's and have been adopted in reasonable quantities in areas such as rental vehicles, fleet management and delivery services.

The function of such systems is limited to basic navigation — finding locations easily or avoiding getting lost. The first such system was introduced by Toyota in 1987 and in fact about half a million systems had been sold in Japan, prior to their emergence on other continents around 1994. An example of a typical modern navigation system is shown in Fig.1.

It illustrates the functions which are implemented on an integrated vehicle navigation / driver information system (note the two antennae, for both GPS and cellular communications systems). The GPS receiver is typically not a large or complex circuit and is shown in Fig.2.

The main components are a microprocessor, Flash EEPROM memory chip and an analog receiver chip. Also illustrated in Fig.1 is the controller for the CD-ROM, which displays the stored maps on an LCD panel mounted on the dashboard. Some systems may also include control circuits for voice recognition and a text-to-speech controller, included to simplify driver interface. Inputs to the system are shown from the vehicle bus, airbag and audio system.

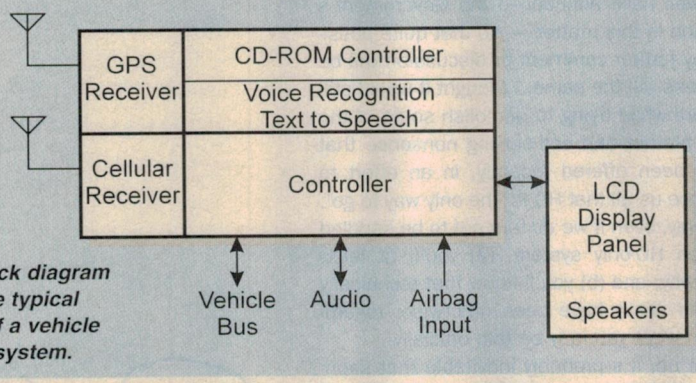


Fig.1: A block diagram showing the typical functions of a vehicle navigation system.

Additional functions

The navigation system performs many functions, each of which require quite significant processing performance. A map is displayed in real-time on the LCD panel and is updated continually from the CD-ROM source. As well as destination, point of interest information such as re-fuelling locations can be also be displayed.

Another common function of the navigation system is to calculate the route with the shortest driving distance. In countries which offer widespread RDS (Radio Data System) transmissions, up-to-date information regarding traffic conditions can also be factored in.

As well as the map, a voice guidance function is also usually employed. This is an audible announcement from the system the

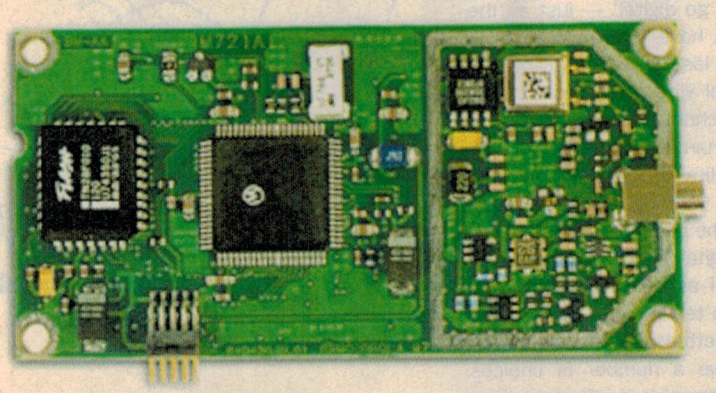
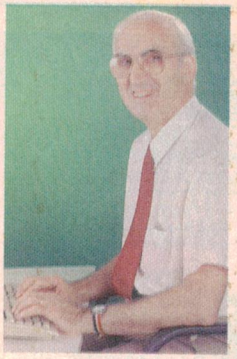


Fig.2: Inside a modern GPS receiver -- as you can see, there's not much to it these days...

(Continued on page 91)

Forum

Conducted by Jim Rowe



Digital TV, DVD zoning and pitch, and more on computer privacy

Some of this month's missives will hopefully get your adrenalin flowing again after the holiday break. To start the ball rolling, I'm also buying into the thorny question of whether Australia's coming digital television system should be limited to high definition only, or kept flexible by allowing standard definition as well.

I DON'T KNOW about you, but my own adrenalin has been flowing a bit recently, in response to various stories in the daily media about the coming of digital TV to Australia and whether it should be only 'high definition' (HD) or 'standard definition' (SD) as well. Some of the stories have been so garbled, and some of the statements reportedly made by various key players so clearly designed to confuse rather than clarify the real position, that frankly I've been busting to make some comments of my own.

Now, I realise that by the time you read this, Communications Minister Richard Alston may well have announced the Government's decision in this matter — so that quite possibly any further comment or discussion will be pointless. All the same, I thought it would still be worthwhile trying to demolish some of the more blatant and self-serving nonsense that we've been offered recently, in an effort to convince us all that HD is 'the only way to go'. That way, even if we *do* turn out to be saddled with an HD-only system, (a) you'll at least know why; and (b) you'll know that technically it could easily have been otherwise, regardless of what you may be told officially.

First up, it's probably inevitable that sooner or later, TV will 'go digital' — just as the familar analog LPs have given way to CDs, and videotape and laserdiscs are giving way to DVDs and digital video recorders. Digital audio and video technology is more efficient and more robust than analog, and basically delivers better quality with steadily reducing real cost. There's nothing much to argue about, in terms of the general trend to digital.

But as far as digital TV is concerned, the fact is that as well as being more efficient than analog TV, the technology is also much more flexible. The nett result is that when you go digital, you have a number of choices when it comes to balancing image resolution,

sound quality and bandwidth — which translates into channel space.

For example into a single VHF or UHF channel that's 7MHz wide, as currently needed for a standard-definition analog signal with stereo sound, you can basically fit five or six digital SD signals with stereo sound. Or you can fit a couple of higher resolution signals with Dolby Pro-Logic sound. Or you can fit one you-beaut HD signal with 5.1-channel Dolby Digital surround sound, multiple camera angles, different languages and all the trimmings.

Technically, it's all possible. But the problem is that other factors are taking precedence over the technical aspects. In fact one main factor is tending to dominate the thinking of just about everyone: money. And specifically those who anticipate making large amounts of it from the digital TV changeover seem to be doing their best to confuse the very participants who'll ultimately be expected to shell it out: the consumers.

Broadly speaking, the existing TV networks seem to want the Government to ignore the SD option and go for HD, mainly because it will maintain the bandwidth needed per signal and thus prevent channels from being freed up. In other words, lock out new players and maintain their own 'licences to print money'. Of course they'll have to invest in new HD equipment for production and transmission, but the incremental cost will probably be a drop in the bucket compared with what they might lose from greater competition. In any case, programming is probably their major cost, and with HD they'd still only be having to buy and transmit one programme at a time...

To a certain extent, the TV set makers are also keen to push things towards HD, because this option will create a whole new consumer market. In order to receive HD and see it in all of its glory, consumers will need a completely new digital HD set — with a screen big enough to show the difference. The snag is that for the first few years at least, such sets are likely to cost somewhere around $8000 - $10,000 each.

At that kind of price, of course, the take-up rate is likely to be very slow indeed. But industry reasoning seems to be that if they can get the Government to mandate 'HD only', consumers will really have no option and will find the money somehow...

How about much lower cost 'set-top box' converters — the kind of device which would let consumers watch an SD version of digital HD transmissions, on their existing analog sets? Again, these are technically quite feasible, and even initially their price could be kept below $400 - $500. So *many* more people could afford them, and the take-up rate would be much faster (at least in terms of people watching digital TV in *some* form).

But the TV networks don't seem to like this option, perhaps because once the viewers have low cost set-top converters, this would open the door to SD — and hence more competition. Their advertisers probably aren't too keen either, because they'd be spending lots of money sponsoring expensive HD programmes and paying for expensive HD commercials, when most viewers would only be watching them in SD anyway.

This seems to be the main reason why the TV networks and advertising groups have been running a campaign pushing HD for all it's worth, and spreading fear and uncertainty about set-top converters and the SD option.

How about the poor old consumer? Well, from what I've seen, most consumers have been thoroughly confused by the whole business. Which means they've been prevented from being able to decide what's really feasible, which options they'd really like and what's likely to be foisted upon them...

For example how many consumers really need, or even *want* HDTV? Especially if they're going to have to invest in a hugely expensive new big-screen set, to see any significant advantage? Frankly I think most consumers would prefer standard definition, and a better range of choices when it comes to programming — i.e., the SD option. Or at the very least, a system that allows *both* kinds of signal to be broadcast, either at different times on the same channels or at the same times on different channels.

I won't rave on much more about this at present, because basically I want to get YOU thinking about and discussing it. For the present I'll leave you with this thought:

If you've seen a movie played from DVD, on a TV with a decent-sized picture, you'll know that the results can be very impressive indeed. But whether you've realised it or not, you've been watching essentially *standard definition* digital TV. That's right, not HD — just SD.

Do you really want better picture quality than this, especially if you're going to need a

Forum

very expensive big-screen set to see the improvement? Or would you be perfectly happy with this kind of quality, and a much better range of programme choices?

I know which of the two I prefer, and considering the number of people who happily watch much poorer pictures from VHS tape, I don't think I'm alone. It'll be very interesting to see what the Government decides we're going to get, especially when there's so much 'big money' pushing for the HD-only option.

All-region coding

Moving on, our first reader contribution actually touches on the HD/SD debate, but then brings us back to DVD regional coding. It comes from reader Michael Coop, an engineer who has apparently moved back to Australia recently after a stint working in South-East Asia:

I personally think consumer HD is a waste of time... most people haven't seen good quality analog TV yet, so digital SD would be more than enough for 99% of home expectations. Look what response DVD has raised, among those that have seen well mastered discs. DTTV is pretty much exactly the same.

I have been following the DVD zoning debate for quite some time, and in response to the November Forum would simply like to ask how it was possible to make my recent purchase, and what are the ramifications?

It's a major branded DVD player, purchased in September 99 — off the shelf in a major suburban electrical retailer. I could have purchased 10 units at the same time, and it's also available in other branches of the retailer. There's no region lock, and no macrovision protection fitted.

Put in a disc, and the front panel display says 'JAPAN' or 'USA' or whichever zone the disc is coded for, then plays happily away. The instruction manual is printed for region coding, but in the space where they over-print the specs for your particular model, it is properly imprinted 'ALL REGIONS'.

My purchase was intentional. I was looking for a unit that would handle multi-region discs, as I travel often enough to buy discs at a better price. Obviously this well-known manufacturer wasn't a signatory to the DVD licencing at some stage, and for the time being, I seem to be the winner.

(Continued on page 95)

Computer privacy

In last November's column, I ran a couple of responses to Tom Moffat's piece in the July issue last year, on computer and internet privacy issues. One response came from Wollongong reader Benjamin Low, who while not entirely happy about the trends Tom had noted, did seem a little less concerned about them.

Well, since then Mr Low has emailed me again, with some further comments on the same topic. I thought you might find them as interesting as I did:

I was pleased to see the issue of computer privacy discussed in November 99's Forum. I do believe that this will be a topic which will become increasingly important as computer usage continues to pervade our lives.

I'd like to clarify and expand on my previous missive, if I may.

With regard to registering software/web-site accounts, you asked "Do you mean that ...the only way to avoid getting on a marketing database is to avoid registering software...?". Absolutely. The NSW Department of Fair Trading have advised me that it is not necessary to provide any personal details in order to obtain warranty support. The only reason these companies want your information is for the latest management fad — Customer Resource Management, or one of the many variants thereof. You may have reasons to opt-in to such a program, however you are by no means obliged to.

It remains a practical issue that many companies insist (rightly or not) on your private details. One technique that works for me is to use an alias — I generally submit fabricated information when I can see no other means of avoiding the 'registration' step. Note that I always ensure that this fake data is obviously so, for example entering my age as 123 years, or address as 1 No Such Street, Nowheresville. I also have a couple of free email addresses I use for this purpose.

So far, I have not struck any validation hurdles (an issue unto itself: what stops me from registering god-knows-what under someone else's real name?). I suggest that the problem faced by the correspondant dealing with Omnipage's registration process could have worked around it by supplying dud data. Of course, submitting fake information for any kind of legal agreement is not on :-).

Now, as to protecting yourself from insidious software — there's little you can do as an average (or above!) user. As you note, turning off your web browser's language options (e.g. Java, Active X) tends to ostracise yourself from cutting-edge web pages. (Though my personal experience is that leaving JavaScript on, but Java/ActiveX off, works fine. Note that JavaScript has very little to do with Java, despite the similarity in name).

It is a balance each user must strike, weighing up privacy and security against functionality. In the real world, it would be very convenient to not have to lock up your possessions — you'd never get locked out, tradesmen could come and go without you having to take a day off waiting, the grocery store could deliver your goods right into the fridge.

Of course, the real world is complete with dishonourable people and organisations, as is the online world. And just as in the real world you lock your door, so you should in the electronic one. The software equivalent of a security grille on your front door is known as a firewall — standard practice for company LANs, and slowly becoming requisite for home use.

Thanks for that clarification, Ben. I'm sure readers will be glad to learn of your experience giving fake details in registration too. I assume it's not wise to do this in filling in warranty details, though — that might indeed make it hard to receive help, in the event of trouble! (How is the service tech going to find you in Nowheresville, for a start..)

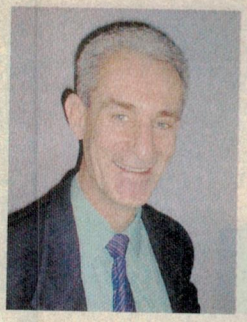
To end up, here's another response on the same general topic, which came from our contributor of long standing in the ACT, Dr Glenn Pure:*I've just finished reading your Forum column on privacy. A point you made was that "... in refusing to register, people often also deny themselves the warranty protection they're entitled to as a legitimate buyer". I thought that trade practices law did not require registration for warranties to be valid.*

On a more interesting point, and one you will likely have been told about since publication: Did you know that Microsoft Office 2000 requires exactly the same registration process that OmniPage does? That is, the software will not operate if it isn't registered and a 'key' provided in response is entered. The key is specific to the hardware configuration of the system. If you substantially change your system, you have to get another key...

Hmmm — thanks, Glenn (I think). I stand corrected about the warranty protection not needing the user to be registered, as both Mr Low and yourself have clearly checked this up. That's reassuring, even if software firms like Caere and Microsoft are essentially forcing us to register our purchases, if we want to use their software at all.

I guess I can now see the logic behind Ben Low's advice about using fake registration information. As legal and legitimate users we shouldn't have to adopt this kind of subterfuge, but with software firms behaving more and more like George Orwell's Big Brother, we probably don't have much choice.

The old retailing motto about the customer always being right really has been relegated to history, hasn't it? One way and another we seem to have very few rights left at all.



INFORMATION CENTRE

by Peter Phillips

Trapping rats, the Pitot and the Venturi tube, project queries and more...

Our topics this month range from the sex life and domestic habits of rats to measuring water flow. A reader explains how to interface a VCR to a computer using a particular video card, and other readers pose questions like measuring the thickness of paint and getting the most out of solar power.

I'm writing this month's column in December 1999, so by the time you read it, the effects of the Y2K bug will be well known. Media attention has been extreme on this problem, and you could be forgiven for assuming it's the only real problem facing large computer systems, other than viruses and similar nasties promulgated by antisocial types with nothing better to do. But not so, if the following is anything to go by. It was sent by a reader who has an interest in pest eliminators, and comes from a booklet included in a recent issue of the magazine *New Scientist*. I don't know which issue, but the article (reproduced below) is dated 1984!

Rats in the belfry

Computers make noises that attract rats. So much so that in Japan, rats are the third largest cause of computer failures. To combat the problem Ikari, the country's leading rat catcher, has developed a trap using sound to attract rats. Proliferating multi-storey buildings in Japan's cities have caused an explosion in the population of Rattus rattus (roof rats), which as the name suggests, are good climbers. They can get into a computer room, regardless of what floor it's on, and then cause serious problems by gnawing at a cable or urinating on a connector, transforming large quantities of, say, a bank's financial data into instant gibberish. Worse, being intermittent, such failures are especially hard to detect.

The first thing to determine was why rats are attracted to computer rooms in the first place. Certainly not food. The answer turned out to be the ultrasonic sounds given off by computer power supplies. The rats seem to think these are made by other rats. The idea that it was sound attracting the rats came, according to Yosuke Watanabe, manager of Ikari's research laboratories, from a paper published by British researchers on ultrasonic communication in rodents. Further investigation, in cooperation with the Japan National Broadcasting Corporation, demonstrated that frequencies centred around 24kHz were particularly beguiling.

The trap that Ikari built consists of three devices: an ultrasonic sound generator programmed to make simulated squeaks; a powerful vacuum generator, activated by the approaching rat, which sucks the helpless creature off to the third device, where it is gassed with carbon dioxide, disinfected, then packed into a cardboard container for subsequent disposal. Such a large trap will, as Watanabe points out, normally have to be installed when a building is under construction. He says that Ikari has completed trials of the prototype, and hope to have it in mass production by the end of the year. (*New Scientist*, 31 May 1984)

However, there's more. Again it comes from the same source, but first here's what the contributor who sent the above has to say.

Pest eliminators

Over the last year or so there have been a number of articles in EA and other magazines about electronic repellers for mosquitoes and other vermin. It seems the 'rat band' is around 22-23kHz. Any word on mice? I expect a smaller animal would respond to a higher frequency.

However, not all pest eliminators are electronic. An American recently visited a North Island farmer to demonstrate his newly developed gopher gun. A wand is inserted into the burrow to inject a blast of propane gas, which is then ignited. The result is a collapsed burrow and blasted gopher. He claims his device would work well with rabbits, but I'd like to see him use it on a wasps nest, from a distance of course. (Dave Wilson, Christchurch, NZ)

Thank you Dave for sending the above article. Also thanks for the following extract, which might even be the research mentioned above. It describes an aspect of rat behaviour that surely can be exploited to deal with the rat-computer problem, but in a somewhat less dramatic way than described above!

Not tonight dear

While making a 'standard observation of sexual behaviour', Rutgers University biologists Ronald Barfield and Lynette Geyer noticed that a male rat sang an ultrasonic song after ejaculating. Further studies showed that this post-ejaculatory ultrasonic chant — which appears to correlate with the rat's contented stertorous breathing — was common to all the rats they studied.

Barfield and Geyer have shown that for at least three-quarters of the interval between copulatory bouts, the male emits a series of calls at 22kHz, apparently arising from the long exhalations of its languid breathing. Since the length of this calling period equals the male rat's recuperative time, and since too the behaviour of the female changes during this period, the Rutgers' researchers suggest that the call conveys a positive 'I'm out of action' message to the female.

Their conclusion is reinforced by the fact that a 22kHz call is also characteristic of males that have been roundly defeated in a fight, and in females who are attempting to resist the mounts of overly attentive males. Perhaps, Barfield and Geyer suggest, the call generally reflects a state of social withdrawal; that "22kHz is a basic 'carrier frequency' for signals denoting states of contact avoidance". It would be interesting to know what would happen if a rat colony was played continuous recordings of these anti-social signals. Could one devise an ultrasonic rat contraceptive? (*New Scientist*, 6 July 1972)

So perhaps there's a clue in the above for someone to invent a more refined system of rat eradication in a computer room. As for mice, I suppose there's a 'frequency', but for now I'm going to rely on the cats.

Now to a completely different topic: measuring the speed of a boat.

Boat speed measurement

The next letter is from a reader asking about measuring boat speed and water flow using a method based on magnetics.

I remember reading a long time ago about an electrical method for measuring the flow of water with some sort of magnetic method. I think it featured in the Circuit & Design ideas section of the magazine, but searching the index on your website and through my own collection of back issues (to 1965) revealed nothing. Can you or your readers help?

On a related subject, the standard way to measure boat speed is with a Pitot tube and pressure gauge marked in knots instead of kPa, but is the relationship between speed and pressure linear? My instinct tells me it should be a square law, but I have no easy means of experimenting to find out. Keep up with a great magazine, I get one almost every month and enjoy it thoroughly. (Bruce Burdekin, Blenheim, NZ)

Thanks for the compliments Bruce. After searching our database I too could find nothing about measuring water flow using magnetism, or indeed using any method. The only way remotely connected to magnetism that I've seen is with an immersed turbine-style propeller that drives a generator. The output voltage is determined by the speed of the turbine, in turn dependent on the rate of water flow.

Another common way is with a Venturi tube, a short pipe with a narrow throat in the middle. Fluid passing through the tube speeds up as it enters the throat, causing a pressure drop across the throat. This pressure differential can be used to measure fluid flow.

Regarding the Pitot tube, I researched this topic and found the following, which I hope is of interest to all, as well as being useful to you Bruce. It comes from Encyclopaedia Britannica (EB).

The Pitot tube

In the mid-18th century the French hydraulic engineer Henri Pitot, studying the flow of water in rivers and canals, invented a device — now called the Pitot tube — for measuring the speed of the flow past a given point. The Pitot tube has been applied to the measurement of wind speed, and is equally useful as a log for ships or aircraft.

A typical Pitot marine log consists of a pair of thin-walled tubes projecting through the bottom of the ship and bent to face the direction of motion. One tube is open at the forward end; the opening being called the dynamic-pressure orifice. The second tube is closed at the end but has openings at right angles to its length; these openings are the static-pressure orifices. When the ship is dead in the water, the pressure is the same in the dynamic and static connections, but, when the vessel moves ahead, the dynamic pressure exceeds the static pressure by an amount that varies as the square of the ship's speed.

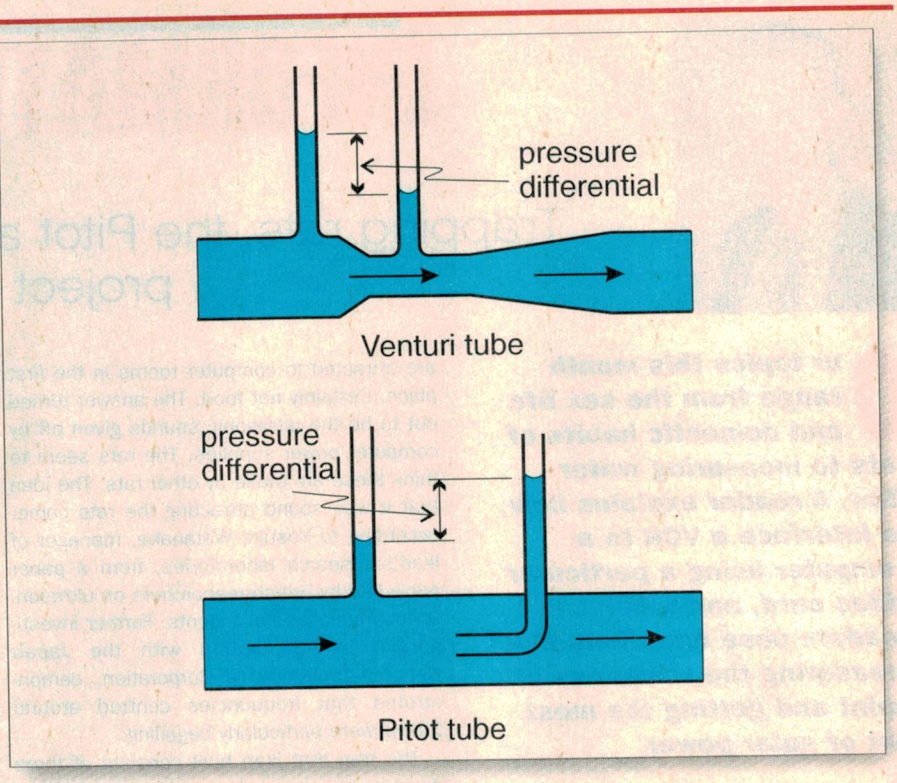


Fig.1: The Pitot and the Venturi tube. Notice that the pressure differential across the Venturi tube is the opposite to that across the Pitot tube.

Another part of the log consists of a centrifugal water pump driven by a variable-speed electric motor. The dynamic pressure produced by such a pump varies as the square of the speed of the motor. The pressure produced by the motion of the ship is exerted against one face of a diaphragm; that produced by the pump is exerted against the other.

Movement of the diaphragm operates the speed control of the motor to equalise the two pressures and thereby make the speed of the motor directly proportional to the speed of the ship. A magneto attached to the shaft of the motor generates a voltage proportional to the speed, and on the ship's bridge a voltmeter calibrated in knots provides a continuous indication of the progress of the vessel. Analogous Pitot logs, with less bulky attachments for translating air pressure differentials to speed readings, are almost universally installed in aircraft.

The diagrams in Fig.1 show a Venturi and a Pitot tube. Note Bruce that it's a square law relationship between pressure and speed, as you figured. There's lots more that can be said about these two interesting devices, but getting back to electronic methods for measuring boat speed, here's a bit more from *EB*:

Sound in speed measurement

In ships, a modern form of log incorporates a pair of electroacoustic transducers. One of these launches a sound wave from a point close to the keel; the second, a few metres ahead or astern, detects this wave and measures the time required for it to traverse the known distance. Motion of the ship relative to the water changes this interval in a way directly related to the speed of the ship. The speed of sound through water is slightly affected by temperature and salinity; even so, the electroacoustic log is much more accurate than its mechanical forerunners.

The Doppler effect—the familiar shift in the pitch of a sound as it passes a stationary listener—also can be exploited to measure the speed of a vessel or an aircraft. Such an effect can be accurately measured in either sound waves or electromagnetic waves emitted from a moving craft and reflected from a fixed object.

So clearly there are quite a few ways to measure the speed of a boat, or the flow of water, but all without magnets. If anyone knows how to use magnetics for this, please let me know.

Sticking with measurement questions, here's a request that asks for something I think somewhat impossible.

Measuring paint thickness

I am interested in measuring the thickness of a film of paint by comparing the time of flight of a laser beam compared to an ultrasonic beam. The laser beam would hit the surface of the paint, while the ultrasonic beam would pass through to the steel substrate.

I thought I could use an RC circuit with a 555 timer to measure the time of flight, but the gap is so small I don't know if it can be done. The paint film thickness would be as small as 10 microns, so the time disparity is a few billionths of a second. Have you any suggestions? (Bill Fleming, Moolap, Vic)

I guess it could be done using sound and light Bill, but I think it would take more than a 555 timer. The times involved are so small, that getting an accurate and reliable measurement would need some pretty sophisticated gear. I'm sure there are other ways, but none come to mind. Perhaps readers might have some ideas?

Video wiper project

The next letter is from a reader who wants to add a few more effects to the April '98 Video Fader and Wiper project.

I recently built the Video Fader and Wiper from a Dick Smith kit. It works well and I have no problems. However, is it possible to reverse the direction of wipe to add a range of effects? As an extra bonus I would be able to blank out the dreaded 7 ghost logo at the bottom of Channel 7 programs. I'm a 77 year old retired TV technician, who has been an EA reader for over 30 years. (Cyril Vickers, Elizabeth Downs, SA)

I referred your question to Jim Rowe, the project's designer. He explained it would not be possible, as the device is essentially analog, with its timing based on sync pulses from the video signal. To achieve a wider range of effects would require a digital system, in which virtually anything becomes possible.

Solar power

Getting electrical power from the sun is becoming increasingly popular, fuelled by social attitudes and affordable solar power systems. But what about the cloudy days?

In November '94 you published a circuit for a solar panel regulator, which I subsequently built. While it works ok, it does not have any voltage step-up ability. Much of the time the 5A panel I have gives only 11.5 to 12.5 volts, because of cloud cover and generally gloomy days in winter, so there's no current to charge the batteries.

I have seen a regulator circuit with step-up ability in a rival magazine, but it only has an output capacity of 2A, so it's of no use to me. Do you have plans to publish such a circuit in the near future? I'm sure it would create a lot of interest, particularly in view of the number of so called 'intelligent' regulators currently on the market. These are not only expensive, but do not have a voltage step-up capability. (L. Ingram, Beaumaris, Vic)

I spoke with the designer of the solar panel regulator project you mention Mr Ingram. He explained that voltage boosting under low sun conditions is rarely useful, as the solar power into the panels is usually too low. Solar panels like full sun, and give a much reduced power output under cloudy conditions. Voltage boosting can be useful when the solar energy is moderately strong, but is virtually useless on cold cloudy days.

I suggest you try adding more solar cells, to get a wider pick up area. You'd need to switch these additional cells into the circuit as demanded by the available solar energy. The idea, as you can see, is to maintain a suitable input power to the regulator, which can only be achieved by getting more power from the sun.

VCR-computer interface

In the August '99 issue a reader (J. Schamberg) asked about interfacing a VCR to a computer. I discussed various ways of doing this, but because my knowledge of the latest types of video cards is limited, I invited readers to comment...

I am surprised that you missed the obvious solution of using some form of video capture device. In your intro you even mentioned TV tuner cards. Many of these have video inputs and outputs designed to connect to a TV or VCR (either NTSC or PAL formats). Some of the newer video cards also have composite video outputs, but I'm not sure whether they also have inputs, so they may not be so useful.

My own Legend video card (type 64MiTV; it's even Australian made!) has a TV tuner as well as composite video in and out sockets and also sound in/out. This allows me to import and export video from my VCR with all manner of editing in between, limited only by the available software and hard disk space. On that subject, there are many freeware/shareware image editors available and also other (cheaper) video capture cards around, including at least one that connects to a PC via the parallel port, avoiding the hassles of opening the PC and changing the video card. If adding titles is to be the only requirement, then disk space should not be too much of a problem. (M. Paddick, Toowoomba, Qld)

Thanks Mr Paddick, I was not aware that some video cards support composite video in/out at conventional TV line and frame rates. Obviously this is the best way to interface a VCR to a computer, as it allows you to use the latest computer system and software to edit videos.

What??

Here's a resistor question, but one that doesn't need a circuit. It comes from Ian Davidson (Mitcham, Vic), who sent it some years ago. I'll have to improve my filing system it seems. Ian asks:

Fred and John are mates who enjoy electronics as a hobby. Fred asks John how many and what value resistors are needed for the circuit board he is assembling. Being in a difficult mood, John answers by saying that the product of their values equals 2450 and their sum equals twice Fred's age (an integer). Fred thinks about this, then asks for more information. John replies saying that the smallest value resistor must have a 1% tolerance. What are the resistor values (they can be any desired integer value by the way), and how old is Fred?

Answer to January

Mike suggested that the engineers fill the hole with ice. From there you can probably guess the rest. Yes, there would need to be suitable waterproofing around the press, a way of removing the water as the ice melted, ways of ensuring the press didn't hit the side of the hole, but all easy enough to achieve.❖

Notes & Errata

Surround Sound Decoder (May 1999):

On the circuit diagram in Fig.3, C32 is shown connected between +Vcc and ground. It should instead be shown as connecting between +Vcc and -Vcc — across the supply rails of IC8/IC9. The PCB and overlay diagrams are correct.

750A Electric Vehicle Controller (December 1999):

There is a mistake in the circuit diagram on page 41: Diodes PV1-4 should be type PVI5100 (not PV5100). The parts list and overlay diagrams published in the following issue are correct.

Video Clock/Message Generator (August 1999):

The schematic diagram (page 61) should include two 0.1uF supply bypass capacitors C1 and C2, as shown on the component overlay (page 62). Also, C11 is shown as 390pF in the schematic and parts list, but should be 33pF to set the correct clock frequency for the PIC micro (IC2). ❖

MOFFAT'S MADHOUSE

Tom's accidental recording studio

Isn't it funny how uses develop for things acquired for a completely different purpose — in this case a laptop computer and some accessories that were added bit-by-bit. As more and more 'things' were hung upon the computer in question, the whole seemed to add up to something greater than the sum of the parts. Which is how I ended up in the professional recording business!

The computer itself has been around for about a year and a half. You've read about some of its adventures. This is the Sony laptop that came out of the factory with an early version of Windows 98, and with so many bugs the thing would barely run. I eventually tossed Windows 98 from the cranky Sony and replaced it with Windows 95 — older and less sophisticated, but oh so much more reliable. Looking back on it, going backwards was in fact a great leap forward as far as that computer was concerned.

Most Sony computers are sold under the VAIO label, which means they are designed with multimedia especially in mind. They have excellent graphics capabilities, and the very best quality sound cards. Anyone who restricts one of these computers to internet browsing or word processing or business uses is clipping the machine's wings before it even leaves the ground. Realizing the computer's possibilities, it wasn't long before I was fooling around with MP3 music files, blowing my brains out through a pair of stereo headphones.

One of my many part-time jobs is doing sound mixing for bands and stage productions. Now I seem to have become the 'house sound guy' for a theatre- restaurant called the Upstage. This venue features things such as a comedy revue filled with Monty Python sketches on one night, and opera highlights on the next. As they say, variety is the spice of life.

The comedy productions always have lots of sound inserts (Liberty Bell March, followed by a raspberry noise, followed by "...and now for something completely different!" in the best John Cleese style). The music, and the stage action, need to be coordinated with split-second timing, so the idea of playing CDs or cassettes directly is not very practical. Prior to the shows I record the music and sound effects into MP3 files, arrange them in order, and then play them from the computer on cue. The sound is thus delivered in a lively manner through the PA system.

All you need to record your own CD is a laptop, a mixing desk, a CD-ROM burner and a great chunk of hard drive space. Of course, having a jazz trio from Portland, Oregon doesn't hurt, either...

Ah, the PA! Yet another computer accessory. Following three years of renting stuff, I decided to buy my own. A couple of thousand dollars later I had a pretty good PA system based mostly on Mackie and JBL equipment. The centrepiece is a Mackie 1402 mixer containing six microphone inputs, four stereo line inputs, a stereo main output, a stereo control room / headphones output, an auxiliary / foldback output, and a second auxiliary output. Most of the connections come out the top of the mixer instead of the back, so it looks rather messy. But with portability in mind, it can be hooked up and torn down with ease since everything is so visible.

The little Mackie mixer is laughed at by some of the big-time sound guys around here, on the grounds that you need at least 24 and preferably 48 microphone channels before you can call yourself a pro. And then you go out to some gig and see maybe four or five mics plugged into one of these whopper mixers — the rest wasted, and all the more weight to carry around. For my kind of work the little Mackie is just right.

The Mackie portable mixers are promot-

ed as 'recording quality' and to further this aim they use strange microphone input circuitry designed for very low impedance, making them less susceptible to noise. It's a little scary when you first use one of these, turning up an empty mic channel expecting to hear some hiss. There ain't any, and the mixer seems totally dead until you plug in a microphone.

The recording specification seemed to be a bit of overkill for a simple PA system, until I teamed up with a guy from the TV station where I work to begin recording performances on video. We designed a feed system to take audio through the AUX-2 outputs. This is sent through a long XLR microphone cable to the camera position, where it is padded down, transformed into unbalanced high impedance, and fed into the camera's external microphone input. Thus the camera gets all performance sound, both live and pre-recorded, through a specially tailored audio mix, independent of the main mix sent to the PA speakers.

Bright Sparq

Another computer gadget I've had around for some time is a Sparq drive - an outboard hard drive that uses removable cartridges of one gigabyte each. It plugs into the computer's parallel printer port and uses it bidirectionally to shuffle great chunks of data back and forth. The Sparq was there mostly to back up the laptop's hard disk, and to store other enormous files such as AVI and MPEG movies on a long-term basis.

This drive is an orphan now; the company that made it went bust. However I was able to snag some extra one-gigabyte cartridges while they were still available. But since the cartridges are no longer made (and cost about $35 each when they were made), the Sparq isn't an option for permanent storage. Once my six cartridges are full, something has to be erased to make more room.

So it wasn't long before another computer accessory came along, this time a CD burner. It's a rather snazzy portable unit from Hewlett Packard, designed especially for laptop computers, and it works like a champ with my Sony. I do a lot of digital photography, and the original idea of the CD burner was to get the hundreds of megabytes of digital photos off my hard drive and onto CDs where they would hopefully last for several hundred years.

The CD burner can record audio too, sourced from .WAV files. These files are closely related to the digital audio format used on the CDs themselves. So you can queue up a bunch of .WAV files, up to 76 minutes worth of audio, and send them off to the CD where they become 'tracks'. The .WAV files are somewhat enormous, around 10 megabytes for each minute of audio.

About a week after the CD burner arrived, I landed a sound job for two performances at the Upstage with a local singer who teaming up with a jazz trio from Portland, Oregon. In addition to a video, the singer wanted a cassette recording of the performance which she hoped to duplicate and sell. Could I record it? Of course. And at the first performance I did just that, feeding the music, mixed in stereo, to my trusty Tascam Mini-Studio cassette recorder.

But for the next night... Hmmm... Now we have a recording-quality audio mixer, a multimedia laptop computer, and a gadget that will turn computer sound files into CDs. Maybe there's a use there — but the laptop's hard disk is so small (two gigabytes total) and those sound files are so big... But... yes, there is a way!

"Hey Susan, we've got your cassette recording from the first night. What say we try for a CD on the second night?" Why not indeed? If the CD doesn't work then we've got the tape from the previous night, and the video in any case. So I spent most of that day messing with the computer and the Sparq drive and the Mackie mixer and the video camera and the CD burner, and eventually a mini-recording-studio / television production centre was born.

A couple of days later my first CD recording job was 'in the can' — we had a master CD, and the cover art designed...

Here's how it all worked out: There were six microphones — one on piano, one on bass, two on drums, and two for vocals. There was the main stereo output to the PA. The AUX-1 output fed to a guitar amplifier which I use as a foldback speaker. AUX-2 went to the video camera as usual. And the control room / phones output, with its very own fader, fed the 'line in' of the computer's sound card.

The Sparq hard drive was hooked to the computer's parallel port, ready to receive each music track as it was recorded as a .WAV file. After the performance, each track would be edited to get clean in and out points and tweak audio levels if necessary. Then all sixteen tracks would be lined up, ready to transfer to the CD burner.

Burning the music

Recording the performance required a certain amount of cooperation from the musicians — and the audience, who had been told a CD was being recorded. I was using some software called GoldWave to make the recordings. This program forces you to specify in advance how long the recording will run, then it lays down a "bed" for the song of the length you specify. The recorder then fills in the blank bed. I guessed five minutes would be the longest any track would go, and happily there was only one close call: 4 minutes 48 seconds for one of the tracks.

After each song it was necessary to save each track (around 50 megabytes) to the Sparq drive, and then prepare an empty bed for the next song. This took a couple of minutes, so the artists had to entertain the audience with patter, mostly about how slow the recording engineer was, until I told them we were ready for the next song.

Anyhow, after much stumbling and bumbling, the recording session was complete. And some people from the audience came up and wanted to buy the CD right then and there, not realizing there was a lot of post-production work yet to come. The final job was to line up the performers on stage and then shoot some digital photos for the CD cover art.

A couple of days later my first CD recording job was 'in the can' — we had a master CD, and the cover art designed. This was to be sent off to a bureau which would churn out 500 copies of the CD, print the cover art from my mock-up, package the CDs in shrink wrapping, and unleash them upon an unsuspecting world.

So now I have a new business — 'live' recordings of a performance, production of the CD, all for a fraction of what a big-time studio would charge. I've smartened up the recording process somewhat with a new software package called Audio Studio which records as it goes instead of requiring a fixed-length track to be prepared in advance. This saves a lot of disk space, and time during the recording session.

Connecting all that gear together, spread all over the room, running from several different power points, caused that old sound-guy bugaboo known as ground loops. These resulted in much unpleasant hum, especially into the video recording system. So we made up some ground-loop disruptors. These things work great... All you need are some male and female XLR connectors, and half a metre of balanced mic cable to connect them together. You leave the shield disconnected on one of the connectors and it's goodbye ground-loop.

Whoever thought a simple laptop computer would evolve into a recording studio? I certainly didn't. I wonder what its next trick will be...❖

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SERVICEMAN

Blue sparks, and a couple of (literally) hair-raising stories...

Out-of-control electricity and electrical safety is the theme of this month's column. Both main stories could have had lethal outcomes if Lady Luck had not intervened.

Some years ago I was involved with girl's school's 'Careers Night' sponsored by the local Rotary Club. I was there to explain and promote the electronic service industry to students about to leave college. To my surprise, I found that the girls were quite interested in servicing, until they found they would have to work on 'live' equipment. They seemed to be terrified of electric shock, even from 6V and 12V battery devices.

That the girls might have had a valid fear recurred to me as I read the two stories that make up this month's column. As you'll see, they both refer to uncontrolled electricity and the very real dangers thereof.

Our first story comes from Paul Stubbs, of Frankston, Victoria. Paul relates a sorry tale of power supplies running wild and high voltages flowing every which way. If this had been a commercial job it might not have been viable. But as a 'love job', it has produced a few clues and tips that will be of value to readers facing similar problems. Here is what Paul has to say....

In the December issue, mention was made of the shortage of 'nitty gritty' TV/VCR stories so I thought you could use the following tale.

It started some time ago after I had fixed a neighbour's Sharp VCR. The cassette loading motor had rusted solid, although there were no obvious signs of liquid having entered the machine. Since then he has been on to me to fix the TV that was used with that VCR. I put it off for as long as possible, but eventually I gave in and said "Bring it over".

The set was a 48cm Aiko, a brand that I had never heard of before. The model number was SC-2037VR, and he explained that it just didn't go. I set it up, pressed the appropriate button and there was a flash of light on the screen. All I got was about a quarter second of raster, so it was off with the cabinet back for a quick look to see if I could spot anything obvious — but there was nothing.

What puzzled me was that I was getting an immediate raster without there being any time for the heaters to come up. My first thought was that the set was one of those 'quick start' units, popular a while ago.

~ With these simple tools, a keen investigator can usually detect which stage of a complex circuit isn't working. ~

Blue sparks!

These sets kept a small voltage on the heaters at all times to aid in a quick warm up. To check out this theory I turned the lights out one night and powered up the set in standby, but I could see no glow.

(Actually, this is not the most useful test. A more reliable one was to check for voltage across the heater pins on the base board. 4-4.5VAC while the set was in standby indicated a pre-heat system. While this produced a very dull glow in a few 'quick start' tubes, most were held below red heat and showed no visible light at all. – Serviceman)

This idea was obviously wrong so I hit the remote's 'On' button, to be greeted by a bluish discharge emanating from around the yoke! The set appeared to be generating far too much EHT and a protection circuit was shutting it down. I have seen circuits of this type in computer video monitors to the extent that I was starting to think it was a standard fitting to all colour CRT equipment. It was not apparent just how wrong I was until the final stages of the repair.

Normally I don't fix enough equipment to justify an account with dealers and manufacturers. So a more active friend offered to order me a circuit diagram and a new line output transistor. I was assured that the transistor was cheap and there was a strong possibility of it being suspect. I also spotted a 4700pf 1kV capacitor with a large rupture in its side, hidden behind a heatsink.

With no other obvious faults, I replaced these parts and powered up the set via an isolating transformer, only to be greeted with exactly the same symptoms. At this stage I was highly suspicious of the 103V B+ rail. As the set would only run for a split second, I opted to connect my oscilloscope up the B+ rail as there was no way my digital multimeter was going to make a sensible reading.

I couldn't believe my eyes when the B+ shot up to 250V; no wonder there was too much EHT. As there was no EHT voltage control, the EHT must have made it to the best part of 60KV. It's not surprising that there was a discharge around the deflection yoke! After checking all the electrolytic caps with an ESR meter, and also checking any surrounding diodes and resistors, I replaced the main power supply IC, an STR5412.

As these ICs cost $12 each, I decided to slowly bring the set up to full power with a Variac. I also elected to use a 60W 240V light globe as a load, having first disabled the line output transistor. This precaution was taken as I have heard of tales about EHT faults puncturing the picture tube, effectively writing the whole set off. As I didn't feel like buying him a new television (or spinning him a story), this seemed the safest course of action.

This TV uses a microprocessor based control system to process remote control commands and to power up the set via a relay. And since I assumed that the processor would not like a slow power-on via the Variac, this stage was by-passed with the incoming power being fed straight into the main bridge rectifier, not via the power-on relay.

Finally I was getting somewhere as the B+ settled down to a nice 103V. However with the light globe removed and the normal EHT circuits restored, my joy was short lived. After about 15 seconds of operation the set started to smoke up.

After a second power up I finally spotted the smoker, a 47 ohm resistor in the negative 33V rail that is used to control the tuner module. This line goes via a MM58655P IC that is on a sub board mounted to one side of the cabinet, labelled in the circuits as 'VR Tuning PWB'. This board contains the micro processor, 5V power supply, and the above mentioned IC. This IC produces the various tuning voltages required by the varicap tuner module to select TV stations.

My first thought was that I was upsetting things no end by directly powering up the main board without going via the 'VR Tuning PWB' (which I had neglected to power at all). So I restored everything to normal and attempted to switch the set on via the remote control.

What an anticlimax that was, back to the half second burst of life fault the set had originally come to me with, but now without the massive EHT bursts that started the whole story. After some probing I found that the 5V rail on the 'VR Tuning PWB' was collapsing to zero on power up, causing the main power relay to drop out.

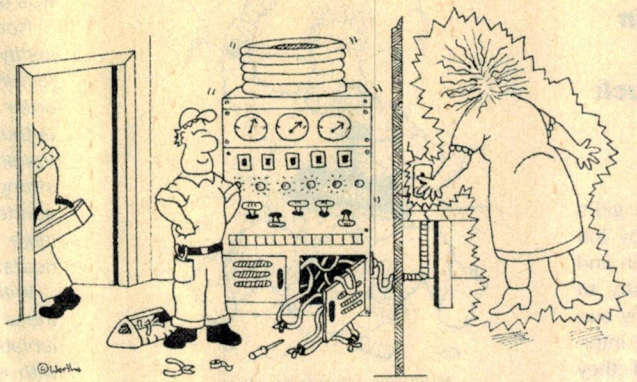
Dead IC

At this point I elected to bypass the 5V supply and run it from a bench supply, back to the smoking 47 ohm resistor, so much for my early theory. As the 33V rail goes directly to the MM58655P IC it was not hard to find this IC was also dead. Sure, I could have blown the IC by feeding it -33V without the 5V rail present. However I think the original 250V B+ fault was the most likely cause.

As the EHT shot up it would have also raised the 33V rail up to 90V which would have done no good to the IC. I now had a working TV, however there was a green cast covering all but 2cm on the right hand side of the screen. Try as I might, I couldn't get rid of it. First I adjusted the green drive and bias control to no avail. With a blank screen (brightness and contrast on minimum) there was 140V on the green cathode. With that voltage, the green gun should have been completely cut off.

Next I tried tweaking the screen control but still without joy. I disconnected the green cathode and the green cast was still there. It was time to get drastic, I thought, so I disconnected the filaments and yes it's still there! I've no idea what is causing the green cast and nobody I've spoken to can explain it either. If any reader has a clue, I would love to hear from them. The set is now back with its owner, with the promise of a follow-up if I hear anything.

Looking back at this set, the events that occurred and their order are most likely are:- (a) STR5412 fails sending B+ up to 250V. (b) Line out stages are able to handle the overload. (c) Picture tube damaged? (d) MM58655P fails pulling 5V to earth. (e) No 5V, so power relay drops out. In the circuit there is provision for an over-voltage Zener diode directly across the output of the power supply. However in their quest to 'cheapen' the set, the beancounters left this part out, in this case with drastic consequences.



~ I should have stayed with the student and supervised his activities, particularly while he was working with mains power. ~

See what I mean about 'uncontrolled' electricity running around a chassis? It's not an uncommon problem and often leads to a write-off, usually after hours have been spent getting the power supply running and the major faults fixed. The problems just go on accumulating until one finally says "enough!"

In Paul Stubbs' case, he had the time and inclination to persevere but most professional servicemen would have called a halt quite early on.

Nevertheless, Paul has introduced several useful ideas which may well help readers faced by similar breakdowns. Particularly, powering sub-sections of the circuit with an external power supply is a good idea.

Since most electronic tuners require a 30 to 40 volt rail to do their job, some other signal source is called for if the integrity of the IF, video and sound sections is to be tested. I have found a simple square-wave generator (two transistors in a multivibrator configuration) is an ideal source of test signal.

An oscilloscope is the ideal tool to view the output of circuits under test, but not everyone has one of these expensive items. Instead, a simple audio amplifier with an untuned RF input can usually be pressed into service.

With these simple tools and a bench power supply, a keen investigator can usually detect which stage of a complex circuit is or is not working. Then it's just a matter of checking all the likely trouble spots until the culprit is found.

Thanks for that story Paul. I found it quite interesting since Aiko is not a brand I am familiar with. From now on I'll have a better idea of what to look for.

Now to continue the theme of uncontrolled electricity, we come to a contribution that might almost 'not have been!'. It comes from John Bell, from Craigmore, South Australia, who recounts two potentially lethal traps he encountered due to incorrect earthing procedures.

They show that one cannot take equipment connections at face value. These examples indicate how one can get caught out on what is apparently a simple, straightforward task and how important it is to check other people's work before exposing yourself, or others, to risk.

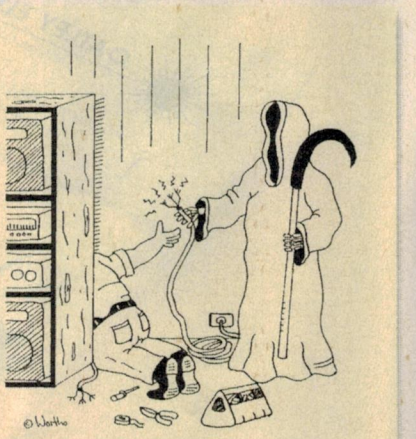
Whilst assisting in the design of equipment to test transmitter valves associated with radar systems, I was given a work experience student to supervise. As was usual, the student was allowed to build up and test a simple piece of electronic equipment, in this case an audio amplifier built from a readily available kit. As will become evident, I let my guard down for a few moments with near disastrous consequences.

After showing the student the elements of soldering and reading circuit diagrams and so on, I continued blissfully with my own work, just answering the occasional query. A few weeks later I was called by the student who complained that the amplifier had been completed but would not work. Quick checks ascertained that the power input transformer had been incorrectly wired with the AC active and earth leads being swapped over. After explaining to the student what he had done, he was left to rewire the transformer.

I was pleased to hear later that the amplifier had been finished and was working well. After testing the amplifier for response and so on, the student returned to college and the amplifier was put away in a cupboard. Several weeks later there was a terrible commotion when a test operator was found unconscious in her screened test compartment. Fortunately, she recovered and I was called in

to help ascertain what had happened.

All such equipment was always carefully checked and for safety was mounted on rubber mats with all operators also standing on a rubberised floor. So you can imagine my surprise when we found that all the equipment boxes and metalwork on the insulated test bench were all at 240 volts. By touching this equipment and the earthed cage at the same time, the operator had suffered a severe electric shock. What was thought to be a carefully set up and safe system had suddenly failed.



~ perhaps we should coin the phrase 'Technicians beware' ... ~

Lethal cable

The answer was immediately traced back to the combination of the student's power amplifier and its associated extension lead. Our work experience student, instead of correcting the internal wiring to the power transformer, had simply changed the leads over in the extension cord, swapping the earth and active wires at one end.

One fault had been corrected by introducing another! And, of course, the amplifier had worked, obviously with that one extension cord only. However, danger now loomed as the standard commercial extension lead, now with its plug wiring changed, had been returned to store.

Its use by another person was to lead to near fatal consequences when it raised all external metalwork on the test bench, which would be expected to be at earth potential, to 240 volts. Only a sensitive safety switch had saved a young person's life.

Of course, in retrospect, I realise that I should have stayed with the student and supervised his activities, particularly while he was working with mains power. Fortunately, there was no long term damage done but if it had been otherwise, I would have carried a heavy responsibility.

DIY earthing

The second story, which also illustrates the same sort of potentially lethal trap was when I was asked to trace the source of interference in an extensive bank of home radio and audio equipment.

I noted that the owner had apparently tried to earth it by connecting it to what looked like an earthing rod, half buried in his garden under the window. I saw the connection of the earth wire to the so-called earth had simply been made by twisting two wires together. I should have looked more closely. Grabbing the two loose wires with one hand, I received an unexpected electrical shock.

Very annoyed with myself and believing that somehow the earth connection from the equipment had become live I went back inside, disconnecting the owner's mish-mash of wiring and finally, with a flourish, pulling out the mains plug.

I went back to stand in the flower bed, next to the house wall, intending to re-establish the earth to the half-buried earthing rod in a proper fashion. As I touched the loose wire I received a severe electrical shock which nearly terminated me.

After drawing a few deep breaths, I had a closer look at the so-called earthing rod only to find that there were mains wires also coming out of flower bed.

The customer then informed me that he had recently removed a small electrically heated green house from under his window. An electrician had provided the original sub-surface feed but the customer had apparently snipped off these feed wires at flower garden ground level, leaving the earth wire to connect to his ground return from his equipment indoors. How he managed this without electrocuting himself I'll never know.

My response was to ask him, possibly with some restraint, to call a qualified electrician before someone was electrocuted in his newly planted flower garden.

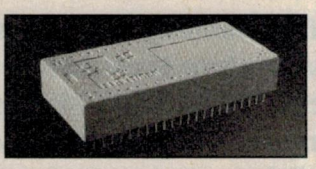
It is often said 'Buyer beware'; perhaps we should coin the phrase 'Technicians beware...

You can say that again John! Both of those stories contain eloquent warnings of the dangers inherent in mains wiring. The first story imputes ignorance to the student and lack of proper attention by the supervisor. The second story reveals the colossal ignorance of the householder. Like you John, I wonder how he cut the mains wires without killing himself. At the very least there must have been a spectacular flash as his cutter shorted the Active and Neutral wires!

Some people just don't deserve the luck they experience. If I had that sort of good fortune, I'd take it down to the Casino and die a rich man... Thanks for those stories, John. I hope they jolt some people into reviewing the way they handle mains wiring.❖

THE TIGER COMES TO AUSTRALIA

You've seen the BASIC Tiger and Tiny Tiger advertised in the US magazines: they are now available in Australia from JED.



Tigers are modules running true complied (not tokenised), Multitasking BASIC at 20 Mhz, but only draw 45mA. They have memory, 4 x 10-bit analog inputs, digital I/O, two serial ports, RTC, and are superb small controllers for scientific and industrial applications. **A Tiger with 128kB FLASH, 128kB CMOS RAM and RT clock costs only $162.** A development system (W95), with a proto board, is only $275. JED has a local board/controller with LCD/Kbd and industrial I/O.

See our www site or call for data sheets.

RS232 to RS485 Converter

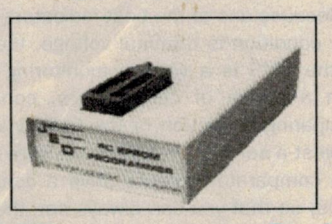
The small plastic case 100mm by 55mm by 25mm is an Australian-built RS232 to RS485 optoisolated converter. It connects a PC or PLC RS232 serial port to a multidrop RS485 differential cable up to 4,000 ft long.

The J995X converter has an internal microprocessor to automatically connect the transmitter to line, so the user program need not use the RTS line for RS485 TX control.

Cost $160 plus $20 plug pack.

$300 PC-PROM Programmer
Also: $145 Eraser with timer.

This programmer plugs into a PC printer port and reads, writes and edits any 28 - pin or 32 pin PROM without needing special plug-in cards.



JED Microprocessors Pty Ltd
www.jedmicro.com.au
173 Boronia Road, Boronia, 3155
Ph 03 9762 3588
Fax 03 9762 5499

(prices do not include freight or sales tax.)

Battery Management System from Oatley Electronics

Environmentally friendly solar or wind-derived power systems usually store their energy in 12V or 24V batteries. The Oatley Electronics Battery Management System comes in low cost kit form and provides a very effective way to monitor battery condition, warn you of overcharging or low battery voltage, and actually prevent excessive discharging.

by Jim Rowe

NOWADAYS MANY PEOPLE get at least some of their energy needs via 'environmentally friendly' solar (photovoltaic) or wind power systems — most of which use banks of 12V or 24V accumulators to actually store the energy, in low voltage DC form. And this kind of battery doesn't come cheaply, so it's important to look after them.

That means ensuring that they're protected from either being overcharged or 'flattened' (excessively discharged), and generally kept in a nicely charged state. Until now, this wasn't exactly an easy thing to do, unless you've had a fairly fancy (and expensive) battery management system.

Happily, though, it's now possible to achieve the same result a lot more cheaply, thanks to Oatley Electronics and the 12V/24V Battery Management System kit (K141) they've recently added to their range.

Basically the BMS is a compact monitoring and control circuit, most of which fits on a printed circuit board only 116 x 79mm. This slips neatly inside a small two-piece plastic box (supplied with the kit), which Oatley has recycled from a mobile phone maker's obsolete car adapter units.

Because one of the best indicators of battery condition is terminal voltage, the heart of the BMS is a voltage monitoring circuit with a bunch of comparators, constantly comparing a fraction of the battery voltage against a set of 12 reference voltage levels. The comparator outputs drive a column of LEDs, so that you can always see the state of the battery at a glance.

The circuit is easily changed to operate with either 12V or 24V battery systems, simply by adding or removing a wire link on the board.

What about the current drawn by the LEDs — doesn't that waste valuable battery power? Ah, they've already thought of that. The circuit automatically drops into a special 'battery saving' mode whenever the battery voltage drops below the 'fully charged' level, and in this mode the LEDs are only turned on for a small fraction of the time, to minimise current drain. The LEDs only operate continuously when the battery is either fully charged or in the process of *being* charged.

If the battery voltage should fall below a certain level (say 11V for a 12V battery), indicating that it's approaching the safe discharge point, a built-in monitoring circuit can pulse a speaker with audio tone 'beeps', to warn you of the situation. Then, if the load continues to draw current and discharge the battery further, another monitoring circuit detects when its voltage drops further to the lowest acceptable level, and can automatically disconnect the load altogether via a power mosfet.

The actual voltage levels at which these 'audible warning' and 'load cutout' control actions take place can be adjusted via either wire links on the board, or external selector switches if you prefer. The speaker for the audible warning is also an external item, like the power mosfet used to perform the load cutout switching. The speaker itself isn't supplied in the kit, in fact, but the power mosfet is. Along with a smaller mosfet used to drive the speaker, it's salvaged from the same 'mystery box' supplied with the kit to provide the plastic case. Both mosfets are fairly husky TO-220 devices, with the one used to switch the load current a BUK453 or equivalent rated at 100V and 14A. It has an on-resistance of about 0.16Ω, so to achieve the full 14A switching capability it will need to be bolted to a fairly good heatsink.

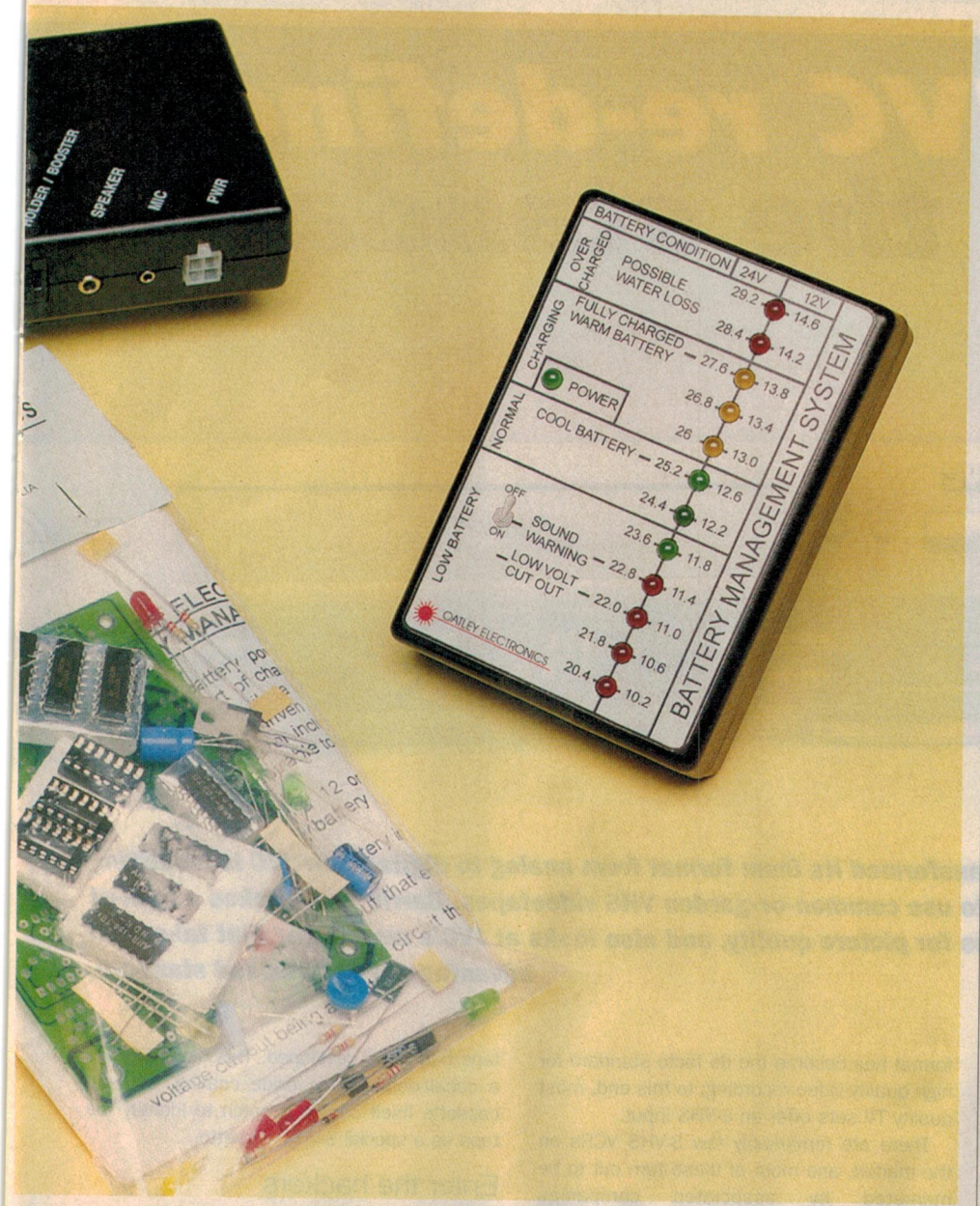
If you need to control loads drawing more than 14A, Oatley can supply the even huskier IRFZ44 devices, with an on-resistance of only 0.028Ω and able to switch up to 50A.

Along with the bag of bits, you also get the black plastic case shown above.
Once you've applied the (supplied) front panel, your Battery Manager will look like the finished unit on the right.

Another nice feature of the BMS design is that the load cutout circuitry includes a latching flipflop, which can be arranged to keep the load disconnected until you press an off-board 'Reset' pushbutton (after checking that the battery has been re-charged, of course). Alternatively by removing a link on the board you can make the circuit automatically re-connect the load when the battery has re-charged.

What you get

In the kit you get the BMS printed board, plus a bag with most of the parts that go on it — including all the LEDs and three 16-pin DIL resistor arrays, which are used to make up the reference voltage divider string for the main voltage monitoring comparators. In addition there's the 'mystery box' used to provide the power mosfets and the plastic case which



houses the finished project. (After the mosfets are removed from the original PCB in the box, quite a few other parts on it can be salvaged for use in other projects, if you wish.)

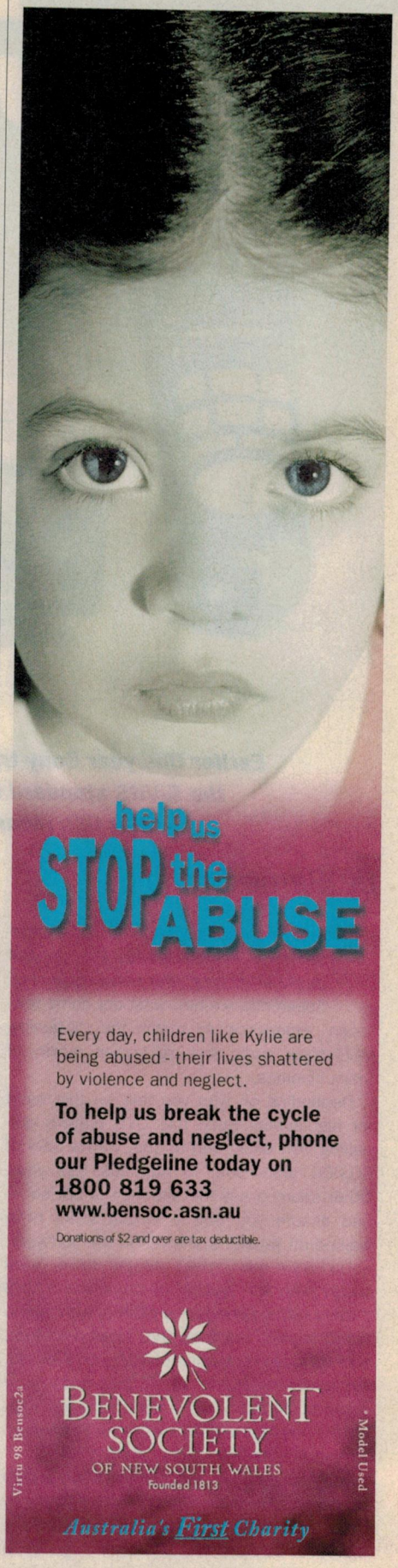
You also get a two-colour printed sticker to dress up the front panel, which Oatley suggest you cover in turn with 'Contact' or similar clear film, to keep it clean. As you can see from the photo a nice feature of the sticker is a guide to the significance of the various voltage levels, for both 12V and 24V batteries.

Needless to say there's also an assembly guide leaflet, which is this case consists of two double-sided A4 sheets. It's fairly brief, but there's a basic explanation of how the BMS works, plus a full schematic and PC board overlay diagram, and instructions for setting it up for 12V or 24V, selecting the voltage levels for the audible warning and load cutout functions, choosing between manual and automatic setting, fine-tuning the voltage comparator levels and so on. Pretty well all that a reasonably experienced kit builder is likely to need, in fact.

It's all quite well thought out, and goes together nicely to make up a neat and very useful Battery Management System — for virtually any situation where 12V or 24V secondary batteries need to be kept properly charged and in good condition.

At the quoted price of only $32 for the complete kit, it seems to me good value for money. Don't forget that Oatley can also supply the heavier-duty (50A) IRFZ44 mosfets for 3 each. They also have a companion 12-24V Solar Regulator Kit for $25.

For more information contact Oatley Electronics, PO Box 89, Oatley NSW 2223 or visit their website at:
www.oatleyelectronics.com. ❖



JVC re-defines the standard

Earlier this year Sony transformed its 8mm format from analog to digital; now JVC is modifying the S-VHS standard to use common-or-garden VHS videotapes. Barrie Smith takes a look at what this means for picture quality, and also looks at JVC's new player that takes full advantage of this revised standard.

by Barrie Smith

To the surprise and delight of home entertainment manufacturers, the general public is growing ever more discerning. Apparently, we now want our home television 'experience' to match the CD-quality, multi track audio and big screen quality of major cinemas.

Depending on who you talk to, this need for high-quality video has DVD players outselling VCR decks ten to one, with a total of 80,000 units sold in Australia this year. Other sources say the situation is not so — and assure you that a million VCRs have walked off retailer's shelves in the last year.

Up until now, most people have been happy with the quality of commercial VHS movies, and generally satisfied with home taped copies. But then DVD altered all that, with its video resolution of 720 x 576 pixels, luminance resolution of 12 bits and colour depth of 24 bits. This is impressive enough, even if you ignore DVD's 500-line resolution, almost double that of composite VHS.

But as we speak, you still can't buy a DVD video recorder — thanks mainly to hedging by Hollywood majors on copyright and release issues. In its place, the S-VHS (or Super VHS) format has become the de facto standard for high quality video recording; to this end, most quality TV sets offer an S-VHS input.

There are remarkably few S-VHS VCRs on the market, and most of these turn out to be marketed by associated companies Panasonic and JVC. The format does, however have a strong following in the semi-pro field.

Higher bandwidth

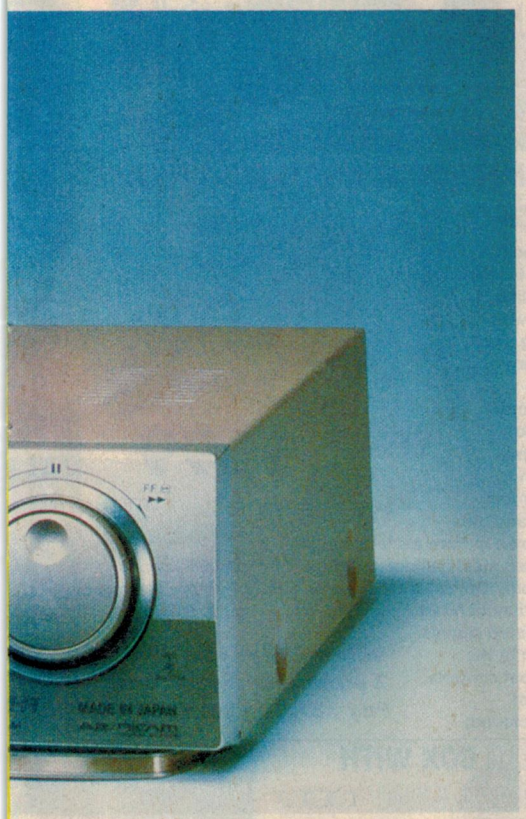
First introduced in 1987, the S-VHS format uses a luminance FM carrier moved upwards from the VHS standard, while the luminance bandwidth has been increased from 1MHz to 1.6MHz. Separate Y (Luma) and C (Chroma) inputs and outputs are supplied with S-VHS VCRs and TVs, and these give dramatic quality improvements if used consistently throughout the system.

There has never been complete compatibility between VHS and S-VHS. A Super VHS machine can record or play in either of the two formats, but a standard VHS machine could never replay an S-VHS recording. Also, S-VHS requires its own tape format — the extra bandwidth required a tape that could handle frequencies above 7MHz, so a new formulation of tape had to be developed. This new tape had a cobalt-doped ferric oxide coating, and the cassette itself carried a notch to identify the tape as a special S-VHS cassette.

Enter the hackers

There will always be that section of society that will find a way to work around the most carefully engineered standards, particularly when money's involved. Currently, 180 minute S-VHS tapes cost around $13, whereas standard VHS cassettes hover between $3-4 each. However, by knocking the right holes in the lower-priced tapes, the cheap-at-heart discovered that they were able to record acceptable S-VHS quality on standard VHS tapes, just like the old double-density floppy-punching trick.

Helpfully, JVC have (in one way) removed the need for the less than elegant process of cassette punching by launching two new S-VHS decks that will record S-VHS directly onto unmodified VHS cassettes. They have also taken VCR deck design to another level and included some highly attractive operating modes and desirable features that will undoubtedly appeal to keen video enthusiasts.



Specifications

VHS and Super-VHS format capabilities on standard HG tape
Multi-system compatibility: PAL, MESECAM, NTSC recording and playback; NTSC VHS playback on PAL TV
B.E.S.T. picture system
G-Code programming
Jog/shuffle control
Multi-brand remote control
Auto SP/LP timer recording
Digital AV tracking
1-Year/8-event programmable timer
Good points: Great way to get top quality from budget priced tape.
Bad points: Presents the problem of exchanging S-VHS tapes with owners of standard VHS VCRs.
RRP: the HR-S5600AM retails for $999, while the fully featured HR-SS7600AM has an RRP of $1349.
Available: Major retail outlets, or contact JVC on (02) 9637 9722, Fax: (02) 9370 8848.
Website: **www.jvc-australia.com**

Resolution up, price down

JVC's has released two new VCRs, and they use a new version of S-VHS called S-VHS ET (Expansion Technology). The new VCR models, HR-S5600 AM and HR-S7600 AM, allow people to record high-resolution S-VHS signals on the more economical and widely available VHS HG grade cassettes. This delivers a boost of over 60% in horizontal resolution (more then 400 lines, as opposed to 240 lines for VHS), even without a Super VHS cassette.

The move mirrors Sony's creation of the Digital 8 format (reviewed in EA, June 1999), which allowed lower cost analog tapes to accept and reproduce digital signals. S-VHS ET, on the other hand is still an analog format, but with a boost of at least 50% in resolution, minimised dot interference and increased colour quality, this new development may well win market share.

For this review we spent some time with the lower-priced HR-S5600AM model. Resplendent in satin champagne finish the deck is certainly handsome. On the basic level it can be used for mundane taping and replay tasks quite happily and can be driven in the simplest fashion; many will probably use only 50% of its potential. But in the hands of a video professional, the deck would be a powerful device indeed.

Full of features

The home video needs of many have changed with the advent of satellite TV, and the proliferation of Internet ordering has created a need for multi-standard players. JVC has equipped the HR-S7600AM and HR-S5600AM with PAL/MESECAM/NTSC 3.58/4.43 recording and playback capability. Super VHS recording/playback is also possible in both PAL and NTSC 3.58. Normal VHS recording and playback of MESECAM and NTSC 4.43 can also be made, and of course you can replay NTSC VHS tapes to a PAL TV set.

The new decks support hifi VHS stereo, which has helped raise TV sound quality close to that of CDs. Another benefit of hifi VHS is that the encoded surround signals on many VHS movie releases can be reproduced through a home theatre's Dolby Pro Logic audio system.

Timer-programmed recording of TV shows is simplified with the G-Code instant programming system or you can tread down the old road and set the timer manually; a function called Express Programming eases this task. People living in areas with unstable power will welcome the Super Timer backup which holds the deck's memory for up to 4000 hours — and with Tape Resume, recording automatically resumes after a power outage.

A deck-mounted wheel — Push Jog Plus — eases navigation along the length of the tape, and the Auto SP/LP Timer recording will switch from SP to LP automatically if necessary, if your tape is under length for the recording period you set.

Flagship model

For the extra $300 the flagship model HR-S7600AM has TimeScan and Time Jog functions, DigiPure picture improvement technology, and a comprehensive set of pro-style editing features.

Time Jog and TimeScan give the user total control over the speed and direction of the playback picture. JVC's proprietary Dynamic Drum system and digital frame memory are combined for the new Time Jog function to enable smooth, seamless slow motion replay right down to +1/3 (in SP) playback speed. Also, thanks to digital audio memory, the soundtrack is replayed at a synchronous, slower pace to match the picture, with the normal pitch retained. TimeScan works to help replay at faster speeds, right up to 9X normal speed — with no noise bars or colour dropouts, and digital audio memory keeps the soundtrack comprehensible.

Also on hand is a group of 'picture improvement' features collectively called DigiPure Technology. These include Digital Wide TBC (Time Base Corrector) which digitally removes jitter from fluctuating video signals and delivers a stable picture even with old tapes and rental cassettes. A precision 3-D Colour circuit provides clear colour separation without smear and sharpens image edges, and digital 3-D YNR/CNR removes fine dust-like noise and uneven colour noise to improve the S/N ratio by approximately 3dB. As well, the Digital 3R Picture System applies edge correction to the Y (luminance) signal to enhance detail. Backing this up is a digital 3-Dimensional circuit with 2MB frame memory.

As found in most quality VHS decks these days, the JVC decks have an equalised signal tracking picture system (B.E.S.T) automatically judges the grade of tape being used as well as the condition of the video heads during recording and playback, to optimise the VCR's performance.

Random editing

Home video editing of a basic nature can be achieved with the random assemble editing function in the HR-S7600AM model. You can specify up to eight scenes on a tape to be automatically edited across to another deck, rearranged in any order you wish. Further, insert editing allows the user to add scenes to a recording without altering the soundtrack, along with distortion-free edits — thanks to the flying erase head.

Both VCR models offer audio dubbing which allows insertion of a new soundtrack (linear track) without altering the video.

Comment

In our viewing exercise we ran side-by-side VHS and S-VHS material recorded on the one HG quality tape. What was apparent was that in all areas the S-VHS vision was superior: fine detail was improved, colours were deeper, there was no dot crawling in areas of plain tone, contrast was up and the blacks were deeper.

Overall, we could confirm that the S-VHS signal as recorded on a VHS HG tape was very close to that of a home-received broadcast signal.❖

Jaycar ELECTRONICS

FEBRUARY SALE

Prices valid until End February 2000

As easy as ordering a pizza!

TECH Store JAYCAR IN CYBERSPACE

www.jaycar.com.au 1800 022 888

OVERNIGHT DELIVERY

OVERNIGHT DELIVERY

GAS SOLDERING IRON

NEW

$59.95

Brand new tool includes a soldering tip and a hot flame (1300°C). It features Piezo ignition, adjustable flame, safety lock and integral folding stand and cap. Cat. TS-1290

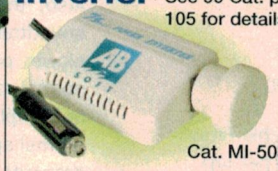
SPARE TIPS

Solder Tip/Catalyst Cat. TS-1292 $17.95

Hot Blow Tip / Catalyst Cat. TS-1294 $17.95

70 Watt 12VDC 230VAC Inverter

See 99 Cat. page 105 for details.



Cat. MI-5034

Was $79.95 Save $20

Now Only $59.95

HUNG CHANG 20MHZ DUAL CHANNEL, 4 TRACE, OSCILLOSCOPE

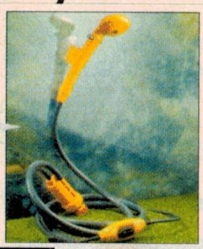
NEW $699

This is our newest dual channel oscilloscope and is designed for the professional and enthusiast alike. It is a practical instrument with well thought out features including a big 6" screen for easy reading, zero parallax graticule to eliminate reading errors, TV synch separator for stable synching of TV video signals and high sensitivity input amplifiers for measuring down to 1mV/div. The heavy-duty rear feet double as a power cable tidy and the versatile carry handle folds down to form a sturdy stand. The CRO is housed in a pressed steel cabinet and the control panel is clearly marked and functionally laid out. Up to 4 traces can be simultaneously displayed using the ALT-MAG and ADD functions while advanced trig circuits ensure stable triggering even with two unrelated signals. From the large clear 6" screen to the comprehensive and well laid out controls, this CRO is as good as it looks! Cat. QC-1908 (Probes not included)

Introductory special - buy 2 probes for the price of 1 Pay $37.50 - Save $37.50

CAMPING SHOWER

NEW



$29.95

You'll never have to 'rough it' again. All you need is a bucket of warm water and your vehicle's 12V battery. The shower comes with 2.1 metres of plastic tubing, pump, showerhead, hanging hook and a nifty carry bag to store it in. Cat. YS-2800

WATERPROOF CAMPING TABLE LANTERN

NEW

This fantastic camping lantern is fully self contained and features a bright 5 watt compact fluorescent tube that produces almost as much light as an ordinary 60 watt globe. Suitable for all manner of outdoor activities, the lantern is fully waterproof and will even float if dropped in the water. Powered by 4 x C batteries, not supplied. Cat. ST-3035

$24.95

UTILITY TOOL/TACKLE BOX WITH TORCH AND INTERNAL LAMP

NEW

Never be stuck without a torch when you need one. This terrific utility box features not just one, but two light sources. A nifty carry handle torch to help you find your way and another fitted inside the lid to illuminate the contents in the dark. Size 300mm (W) x 200mm (D) x 150mm (H) Cat. HB-6324

$17.95

BIG 12V SPOTLIGHT

NEW

The 55 watt halogen globe produces a brilliant beam that is as bright as a car headlight on high beam!!! Housed in a light weight, shock resistant ABS plastic case, the spotlight features a clever lock for extended use. Cat. ST-3027

$19.95

HEAD TORCH LIGHTWEIGHT & VERSATILE

NEW

This versatile, super lightweight torch is clipped to an adjustable headband and has a great swivel ball joint that lets you direct the variable beam to where ever you want it - even when both of your hands are full. Unclip the torch and you can attach it to any suitable object eg pocket, belt, etc. Runs on 2 tiny AAA cells. Not supplied. Cat. ST-3052

$9.95

8 AMP 24 to 13.8V Reducer

NEW

Brand new switchmode DC-DC converter. Supplied up to 8 amp current with up to 86% efficiency. Includes on/off switch and power indicator. Size 125(W)x47(H) x120(D)mm. Cat. MP-3062

$69

Switchmode Plugpacks

Now available! Switchmode plugpacks use electronics, rather than a heavy transformer to drop voltage. They are also regulated, & have higher current capabilities. 2 MODELS AVAILABLE

SWITCHABLE REGULATED 1.25 AMP

240V to 3, 4.5, 6, 7.5, 9, 12V DC Cat. MP-3031

$39.95 NEW

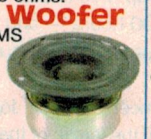
12VDC REGULATED 1.25AMP Cat. MP-3220

$36.95

RE/SPONSE 3" and 4" Woofer

Two new woofers from the Re/Sponse stable. Both are magnetically screened & ideal for use in centre speakers, or micro sound systems. Both are 8 ohms.

3" Re/Sponse Woofer



Power Handling	15 WRMS
Fs	105 Hz
Qms	2.342
Qes	1.037
Qts	0.719
Freq. Resp	105 - 15khz
Sens 1W/1M	82.3
Vas	0.8368
Box vol. (sealed)	0.7L
Inside size	95(W)x130(D)x 60(H)mm

$24.95 Cat. CW-2103

4" Re/Sponse Woofer

Power Handling	20 WRMS
Fs	70 Hz
Qms	2.496
Qes	0.704
Qts	0.549
Freq. Resp	70 - 9khz
Sens 1W/1M	83.76
Vas	3.13
Box vol. (sealed)	1.2L
Inside size	100(W)x85(D)x 150(H)mm

$29.95 Cat. CW-2104

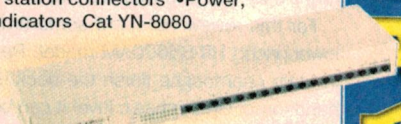
NEXUS NETWORKING HUBS

4 Port Hub

NEW ONLY $199

Ideal for small networks that require high performance at an affordable price. Two hubs can be stacked to increase network capacity. Features RJ45 jacks, indicator LED's, external switch mode power supply and 26 way expansion cable for stacking 2 hubs together. •30mm x 148mm x 125mm •100 Mbps Data transfer • RJ45 1/MPR Uplink Port •RJ45 Work station connectors •Power, Collision, Link/ Activity & utilisation indicators Cat YN-8080

16 Port Hub



Features RJ45 sockets for work station connection. AUI & BNC connectors provide network access. Link and activity indicators show the status of all ports with other indicators showing power, collision status. These hubs can be cascaded up to 4 levels to provide easy expansion. Size 50mmx110mmx440mm(W) •Data Transfer Rate 10Mbps •DB-15 AUI & BNC connectors •RJ45 Uplink Port 16 RJ45 connectors on front panel •Power, Collision, AUI, BNC, and Link/Activity indicators •Complies FCC part 15, Class A/CE Mark Cat. YN-8074

ONLY $219

HOOK & LOOP TIES

Pack of 5 velcro type ties for keeping cabling tidy etc. Reusable. Size 135mm. Cat. HP-1210

NEW $3.95

JAYCAR FREEZER SPRAY

WAS $13.95 Feb. $11.95 Save $2 Cat. NA-1000

MAILORDERS - FREECALL FOR PHONE ORDERS - 1800 022 8

OVERNIGHT DELIVERY

Jaycar ELECTRONICS Number 1 in Surveillance

MAILORDERS - FREECALL FOR PHONE ORDERS - 1800 022 888

MAILORDERS - FREECALL FOR PHONE ORDERS - 1800 022 888

Takes a C mount lens

PROFESSIONAL Black & White CCD CAMERA

NEW

High quality, metal case, uses interchangeable lenses (lens not included). Image sensor - CCD 1/3", 380 TV line resolution. See below for lenses, brackets, enclosures. Size 47(W) x 43(H) x 85(L)mm. Cat. QC-3306

COMPACT SIZE

$119

CCTV LENSES

NEW

Standard C mount lenses, suit all 4 cameras shown. They have fixed aperture of f2, 4mm for wide angle and 8mm for close ups.
Cat. QC-3315 4mm
Cat. QC-3316 6mm
Cat. QC-3317 8mm

$39ea.

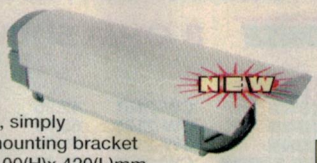
CCTV AUTO IRIS LENS

NEW

Suits cameras QC-3310 and QC-3311. Offers automatic aperture control from f1.4 to f88. Allows camera to adjust to changing light conditions
Cat. QC-3320

$299

PRO INTERNAL / EXTERNAL HOUSING



This weatherproof enclosure suits our 4 Pro Cameras. Includes glass window protected by sunshade. For inside use, simply remove sunshade. Use mounting bracket QC-3336. Size 112(W) x 100(H)x 420(L)mm.
Cat. QC-3330

NEW

$39.50

SMALL PRO CCD MOUNTING BRACKET

Aluminium bracket, angle adjustment, simple but effective.
Cat. QC-3334

NEW

$14.95

MEDIUM PRO MOUNTING BRACKET

Made from impact resistant plastic. 155mm high. Cat. QC-3335

NEW

$14.95

EXTERNAL CCD MOUNTING BRACKET

NEW

Use with the Pro internal external aluminium housing. Bracket length 330mm.
Cat. QC-3336

$29.95

Wireless CCD Camera System

Buy In February and Save $100

KIT INCLUDES:
- Wireless camera
- Receiver & switcher unit so extra cameras can be used
- Power supplies
- Cable & adaptors to monitor
- Plastic carry case

Cat. QC-3445

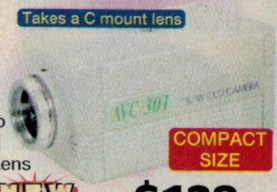
Normally $599 Save $100

$499

Extra Cameras $399 QC-3448

PRO B/W CCD CAMERA WITH AUDIO & AUTO IRIS FEATURE

Takes a C mount lens



Similar to QC-3306, but has audio and will accept the auto iris lens (for auto aperture control for outdoors) . Lens extra.
Cat. QC-3310

COMPACT SIZE

NEW

$129

PRO COLOUR CCD CAMERA WITH AUDIO & AUTO IRIS FEATURE

Similar to QC-3305, but has audio & will accept the auto iris lens.
Lens extra.
Cat. QC-3311

NEW

$259

Takes a C mount lens

1/4" DIGITAL COLOUR BULLET CAMERA

Similar to the black & white unit, except colour. 330 TV lines, 130mA current draw.
Cat. QC-3485

NEW

$259

NEW MONITORS AVAILABLE SOON!!!

Jaycar ELECTRONICS

Takes a C mount lens

PROFESSIONAL DIGITAL COLOUR CCD CAMERA

NEW

Similar to B&W units, except colour. No lens supplied. CCD sensor (512 x 582 pixels). 330 TV line resolution.
Cat. QC-3305

$249

COLOUR CCD PINHOLE CAMERA WITH AUDIO

Similar to our standard colour unit, except pinhole lens.
Cat. QC-3486

NEW

$229

4 CHANNEL B/W DIGITAL VIDEO CAMERA PROCESSOR

NEW

BACK VIEW

This video processor allows simultaneous display of up to 4 B/W camera inputs in split screen mode or sequential observation at 2-second intervals in auto mode. Individual cameras or VCR input can be selected from the push button control panel. The processor is easy to operate and provides 2 video outputs. A built in real time clock provides the time & date of recording and recorded video can be relayed via the video input.
Cat. QC-3360

$375

LOWER PRICES ON CCD CAMERAS

Board Camera with Audio
Cat. QC-3462

Was $119 **Now $99** Save $20

Pinhole with Audio
Cat. QC-3463

Was $119 **Now $99** Save $20

Metal Case with Audio
Cat. QC-3474

Was $139 **Now $119** Save $20

Pinhole in Case with Audio
Cat. QC-3475

Was $139 **Now $119** Save $20

Waterproof Bullet Colour Camera
Cat. QC-3464

NEW **$169**

Dome
Cat. QC-3484

NEW **$239**

Colour with Audio
Cat. QC-3483

Was $249 **Now $229** Save $20

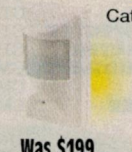
B & W Dome
Cat. QC-3472

Was $129 **Now $109** Save $20

In Case with Illumination
Cat. QC-3466

Was $139 **Now $119** Save $20

PIR CCD Camera
Cat. QC-3478

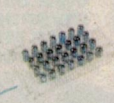


Was $199 **Now $179** Save $20

CCD in PIR Case
Cat. QC-3479

NEW **$149.50**

Infra Red Spotlight
Cat. AA-0290



$45.00

Beware of low priced colour cameras that are CMOS and not CCD

OVERNIGHT DELIVERY

OVERNIGHT DELIVERY

RE/SPONSE 4 OHM CAR SUBWOOFERS

See 99 Catalogue pages 67 & 68.

Description		WAS $	NOW $	SAVE $
6" POLYCONE	CS-2232	65.00	50.00	15.00
6" CARBON FIBRE	CS-2240	79.95	60.00	19.95
8" POLYCONE	CS-2234	79.95	60.00	19.95
10" POLYCONE	CS-2236	119.95	95.00	25.00
10" CARBON FIBRE	CS-2244	175.00	145.00	30.00
12" CARBON FIBRE	CS-2246	219.00	179.00	40.00
15" PAPER CONE	CS-2248	329.50	279.50	50.00

1 YEAR WARRANTY

Low Cost CAR SUBWOOFERS

NEW

8" 75Wrms
Cat. CS-2220
Was $36.95
Now $26.95
Save $10

10" 75Wrms
Cat. CS-2222
Was $54.95
Now $39.95
Save $15

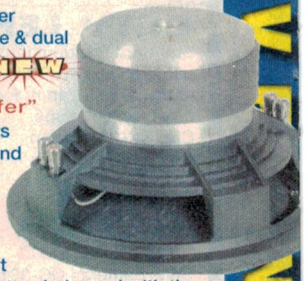
12" 75Wrms
Cat. CS-2224
Was $69.95
Now $51.95
Save $18

RE/SPONSE DOUBLE MAGNET CAR SUBWOOFERS

Two subwoofers 10" & 12" with huge 250W RMS power handling, cast aluminium, double magnets, huge frame & dual voice coils, small box size, 10" 35L, 12" 45L

NEW

Car Stereo Aust. Magazine #10
"After testing our CS-2228 12" Subwoofer"
"The Jaycar speaker surprised me a lot. Looking at its beefy business like construction, I expected it to sound big, brash & brassy. Instead it offered the smoothest most linear sound of the group. Even at low volume this sub still exhibited excellent warmth, weight and authority (exceeding many of the 15"s I've reviewed) but when fed lots of power the Jaycar speaker didn't lose any of its tonal accuracy or control, sounding just as balanced with the rest of the system as it did at low volume". These drivers are awesome!



10" SUBWOOFER
Cat. CS-2226 Was $299
February $249 Save $50

12" SUBWOOFER
Cat. CS-2228 Was $329
February $279 Save $50

"Overall performance was exceptional."

RE/SPONSE CAR SPEAKERS WITH ADJUSTABLE SUPER TWEETERS

All with Titanium tweeters and crossovers.

See 99 Catalogue pages 64 & 65.

Note: prices are per each.

Description	(each)	WAS $	NOW $	SAVE $
4" CAR SPEAKER	CS-2280	65.00	50.00	15.00
5" CAR SPEAKER	CS-2282	75.00	60.00	15.00
6" CAR SPEAKER	CS-2284	79.50	59.50	20.00
6.5" CAR SPEAKER	CS-2288	89.50	69.50	20.00
6x9" CAR SPEAKER	CS-2290	99.00	75.00	24.00

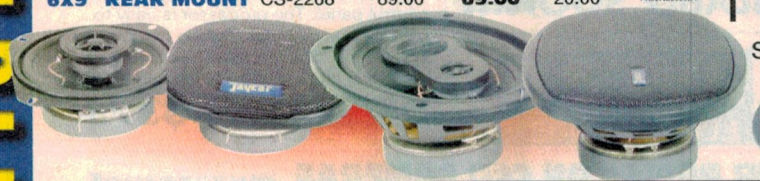
1 YEAR WARRANTY

LOW COST CAR SPEAKERS

Sold in pairs. See 99 Catalogue page 63.

Description	(pair)	WAS $	NOW $	SAVE $
4" REAR MOUNT	CS-2250	32.95	22.95	10.00
5" REAR MOUNT	CS-2254	37.95	24.95	13.00
6" DOOR MOUNT	CS-2258	43.95	32.95	11.00
6" REAR MOUNT	CS-2262	52.95	42.95	10.00
6x9" REAR MOUNT	CS-2268	89.00	69.00	20.00

1 YEAR WARRANTY



RE/SPONSE 8 OHM SUBWOOFERS

Description		WAS $	NOW $	SAVE $
5" POLYCONE	CW-2101	42.95	32.95	10.00
6" POLYCONE	CW-2135	65.00	50.00	15.00
8" POLYCONE	CW-2136	79.95	59.95	20.00
8" CARBON FIBRE	CW-2142	125.00	95.00	30.00
10" POLYCONE	CW-2137	125.00	95.00	30.00
12" POLYCONE	CW-2138	169.50	129.50	40.00
12" CARBON FIBRE	CW-2145	229.00	179.00	50.00
15" PAPER CONE	CW-2148	329.50	279.50	50.00

1 YEAR WARRANTY

See Cat pages 40 to 43 for details.

4 OHM CAR TWEETERS

See 99 Catalogue page 66.

Description		WAS $	NOW $	SAVE $
SUPER TWEETERS Pr	CS-2210	69.95	49.95	20.00
MINI SUPER TWEETERS Pr	CS-2205	59.95	45.00	14.95
RE/SPONSE DOME TWEETER Ea	CS-2212	24.95	18.95	6.00

8 OHM WOOFERS

Description		WAS $	NOW $	SAVE $
6" PAPER CONE	CW-2105	19.95	14.95	5.00
6" POLYCONE	CW-2108	34.95	24.95	10.00
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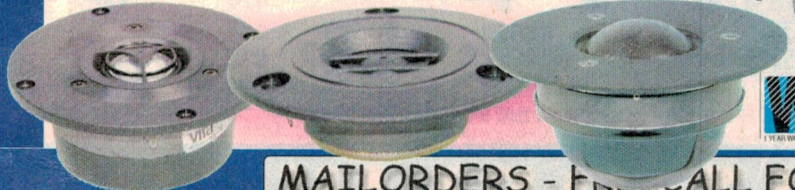

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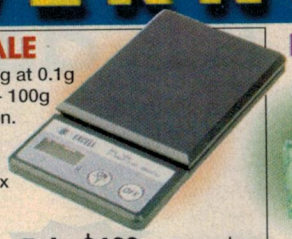

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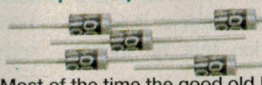

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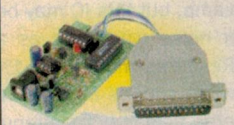

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Circuit & Design Ideas

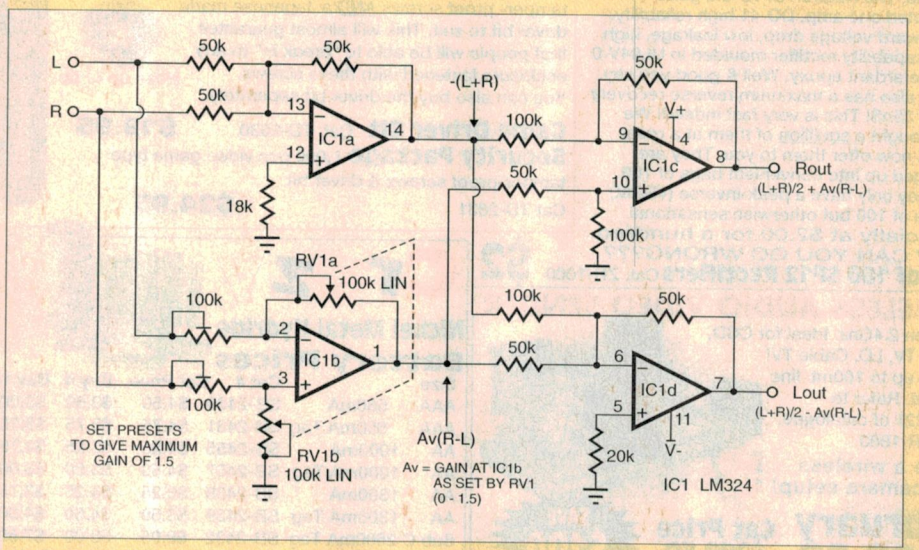
Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

DC to DC converter for small valve radios

The problem with constructing valve receivers has always been getting the high-tension voltage to operate the circuits properly. This ranges from 22.5 volts to 90 volts and more. Whilst it is possible to construct a suitable battery from common 9 volt batteries, the cost is prohibitive. For example, a 90 volt battery would obviously need 10 of them, and at something over $5 each for alkaline types, the cost is considerable. In the last of the battery compatible valves, the filaments were operated from 1.4 volts - that is, a single D cell can light the filament. Wouldn't it be nice to be able to satisfy the high-tension requirements of the receiver from the same battery?

The circuit presented has been around for a long time, and my notebook refers it to an obscure English publication that no longer exists, from the middle 1960's. Operation is simple. Initially both Q1 and Q2 are on, and C1 begins to charge via R1 until its charge is high enough to bias Q1 off. As Q1 controls Q2, Q2 also turns off and the current flow through the transformer core stops. This current flow interruption happens quite quickly, and the result is a pulse of voltage appearing on the secondary of the transformer. Q1 remains off until C1 discharges itself through the transformer secondary and Q1. The cycle repeats

Ideas for experimenters: Variable Stereo Field



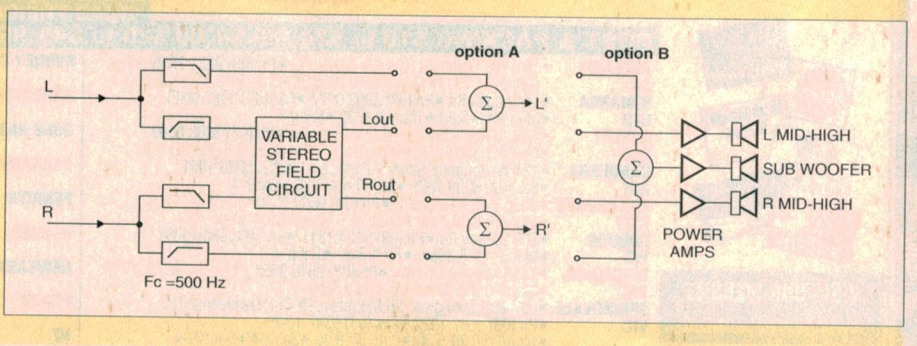
Here is a simple circuit using only one IC, which can vary the usual stereo field from mono, through to normal stereo, and on to 'superstereo'. The effect is controlled by a dual 100k potentiometer (RV1), which controls gain of the R/L subtracting amplifier (IC1b) from 0 to 1.5, resulting in an output of zero to 1.5(R - L) at pin 1. Also, the left and right inputs are summed in IC1a (with a fixed gain of minus one) resulting in an output of -(L + R) at pin 14.

These two composite signals are then summed in IC1d to produce the final left output (Lout; pin 7), where the gain for the pin 14 signal is -0.5, and the gain for the pin 1 signal is -1. The output is therefore (L + R)/2 - Av(R - L), where Av is the gain of summing stage IC1b. In practice, as Av varies from 0 to 1.5 with the pot movement, the circuit's left output varies from (L + R)/2 (mono) to 2L - R (superstereo), while just the L signal will appear (normal stereo) when Av is at 0.5.

The circuit's right output (Rout) is produced by subtracting the signal at pin 14 from that at pin 1, in the unity-gain difference amp IC1c: Rout = (L + R)/2 + Av(R - L). This results in an output varying from (R + L)/2 (mono) to 2R - L (superstereo) as IC1b's gain (Av) varies, while as before, just the R signal will appear (stereo) when the gain is set to 0.5. For both final outputs, unity gain is preserved through the pot's complete control range.

In this circuit, pin numbers are given for the LM324 quad op-amp, but this IC may be replaced by a lower noise type such as a TL074, if desired. Resistors must have 1% tolerance, as otherwise, sounds in the centre of the normal stereo field may be attenuated in the superstereo position. The circuit would normally be connected between the preamp and power amp of a stereo system, however with a conventional integrated amplifier or receiver you can just use the tape input/output connections.

The superstereo sensation may be increased by adding a two-way active crossover filter as shown, so that the stereo field circuit only handles the mid and upper audio frequencies. In the output combining circuit labeled option A, the bass frequencies are mixed back in with the stereo-enhanced signals, to produce processed left and right signals for a conventional amp setup. The arrangement shown in option B however, sums the low-bass parts of both channels for a single subwoofer amplifier/speaker combination, while the enhanced, mid/high signals connect to a stereo power amp and matching speakers.



WIN OUR 'IDEA OF THE MONTH' PRIZE!

As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a Video Inspection Capture System from Allthings Sales & Services, which consists of a colour CCD camera, close-up lens set, adjustable stand and lamp, PCI video capture card and software, plus video cable and two plugpacks. You can find out more about this great system at the Allthings website; www.allthings.com.au.

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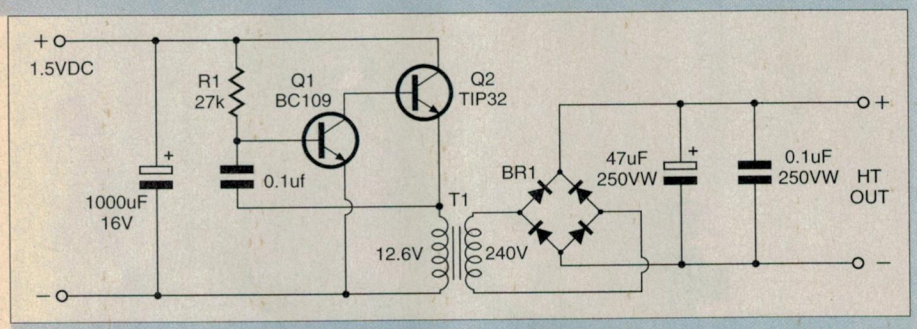
itself at about 500Hz with no load on the secondary. Note the output from the transformer is a series of positive going spikes.

Add a bit of smoothing and we have a simple DC to DC converter capable of supplying a few milliamps at up to 50 volts or so. Beware that with no load connected the output voltage can rise towards 300 volts DC and more, so that voltage can pack a bit of a wallop as it's all stored in the 47uF capacitor. For safety, don't use the unit without a load connected. Even a 10k resistor will pull the voltage down to safer levels.

A prototype was quickly made up using a standard 2851-type transformer. It delivered about 40 volts at 1mA into a simple regenerative detector receiver. When the audio stage was added the converter's output voltage fell to around 20V, but it was still enough to operate a loudspeaker with a comfortable volume, and fill the workshop with the local stations.



Various types of transformers were tried, and every one worked. Some were better than others, and a 24 volt to 240 volt type gave about 30 volts under load, and over 300 with no load. Even an old speaker transformer will work, as did a small vertical output transformer from a junked B/W TV set, and a 600 ohm matching line transformer. R1 can be anything from 18k to 47k, and C1 from 47nF to 0.22uF. The oscillator frequency can vary, so it's worthwhile experimenting a bit so the transformer can operate at its most suitable frequency.

The major downfall of the circuit is its efficiency. It will take over 200mA or so depending on the transformer, so battery life will be rather short - even with an alkaline type of cell. Much the same sort of circuit is used in the flash circuits of cheap cameras, so it's worthwhile checking these out as well.

Peter Laughton
Albion Park, NSW **$30**

THIS MONTH'S WINNER!

Ideas for experimenters:

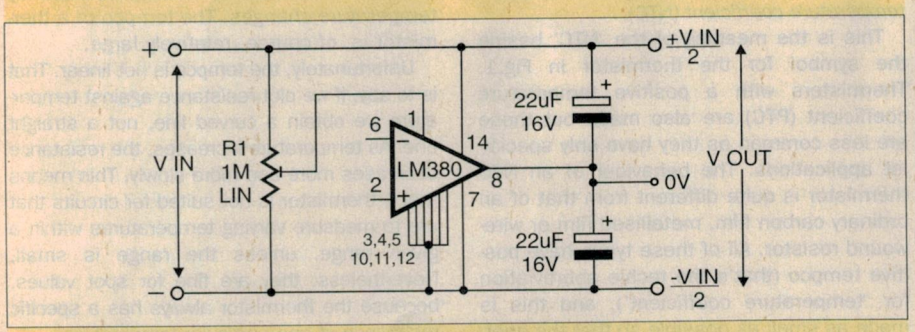
Simple, beefy dual power supply

This circuit offers a cheap and simple way of obtaining a split power supply (for opamps etc), by capitalising on the quasi-complementary output stage of the popular LM380 audio power IC. By using an audio power amp rather than an opamp for this job, the supply can handle quite a high current in the 0V line.

The circuit is very simple, since the LM380 is internally biased so that the output is held midway between the supply rails, even with the inputs (pins 2 and 3) disconnected. Optional trimpot RV1, which should be initially set to mid-travel, is used on the IC's bypass input (pin 1) to trim the output for exactly half of the supply rail.

Regulation of Vout depends upon the circuit feeding the LM380, but the positive and negative outputs will track accurately irrespective of input regulation and unbalanced loads, up to the working limits of the LM380.

Depending on your application the IC's free-air dissipation can be over 1 watt, and so extra cooling may be required - this is normally via metal tabs attached to the ground pins 3, 4, 5, 10, 11 and 12. The device is fully protected and will go into thermal shutdown if its rated dissipation is exceeded, while current limiting occurs if the output current exceeds 1.3A. The raw input voltage should be between 10 and 22 V. ❖



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32 Electronic Elbow

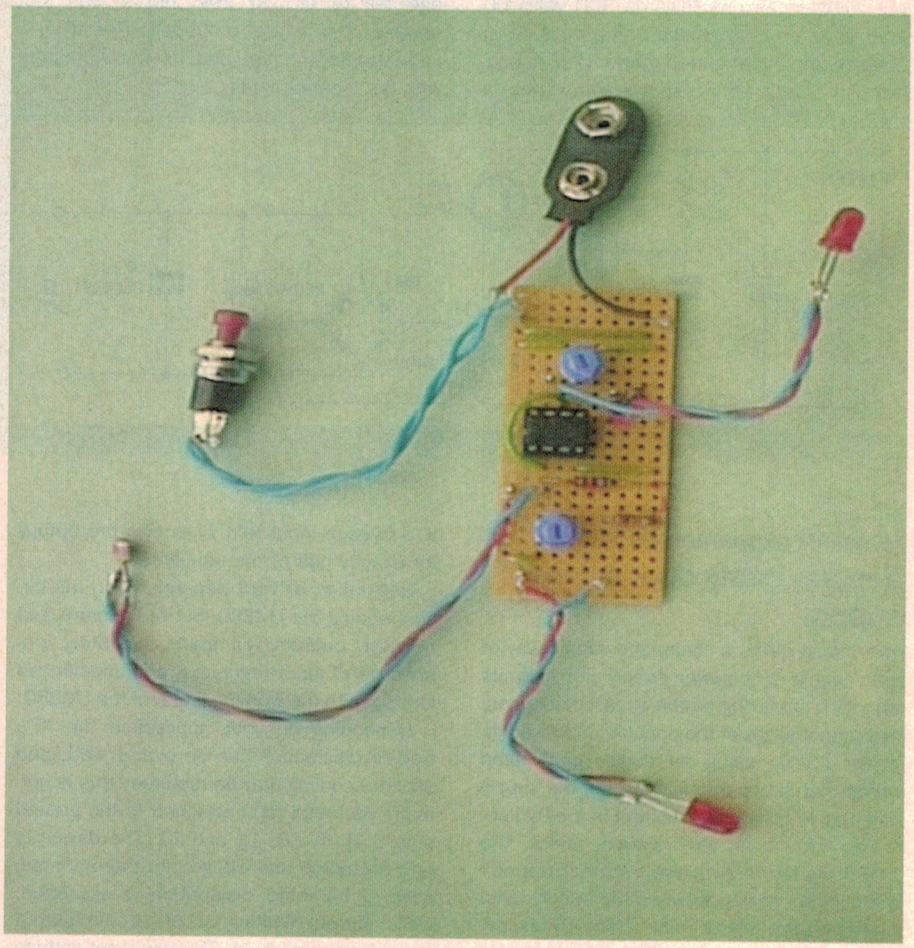
When bathing the baby, the important thing is to make sure that the bathwater is neither too cold not too hot.

Traditionally, you test the water (*before* immersing the infant!) by dipping your elbow into the water. There is a sound biological reason for this. There are tiny sense organs in the skin, specialised for detecting different sensations. The most common types are those for detecting touch, heat, cold, and injury (pain).

However, the different kinds are not just scattered evenly over the whole of the skin. Touch-sensitive sensors are particularly concentrated in the fingertips, the lips and in the region of the temples. They are rather rare in certain other regions such as the skin on our back. This is why it is always so difficult to locate an itch on your back.

Heat-sensitive sensors are concentrated on the fingertips and also on the underside of the forearm, including the area around the elbow. Therefore, if you can stand immersing your elbow in the bath water, it can be assumed that is it safe for baby too.

But this is the 21 century! We need a hi-tech alternative to this low-tech system. This is where the Electronic Elbow comes to the rescue. It is a simple device that indicates whether a temperature is too high or too low. High and low temperature trigger points can be set to any level, so the Elbow can be used for checking on the temperature of a room, a greenhouse, the pool, the shower, a fish-tank, a freezer or anywhere else that must be kept within a certain range of temperature.



How it works

The sensor is a special type of resistor known as a *thermistor*. Thermistors are made by fusing together a mixture of sulphides, selenides or oxides of various metals such as nickel, manganese, copper cobalt or uranium and forming it into a bead, a disc or a rod. Two leads are attached to either side of the disc, bead or rod, and the resistance of the resulting device depends on its dimensions and its exact composition. Most thermistors show a decrease in resistance with increasing temperature. We say that they have a *negative temperature coefficient* (NTC).

This is the meaning of the 'NTC' beside the symbol for the thermistor in Fig.1. Thermistors with a positive temperature coefficient (PTC) are also made but these are less common as they have only specialist applications. The behaviour of an NTC thermistor is quite different from that of an ordinary carbon film, metallised film or wirewound resistor. All of these types have positive tempco (that's the techie abbreviation for 'temperature coefficient'), and this is made as small as possible so that the operation of circuits is not unduly affected by temperature changes. The tempco of a thermistor is, of course, relatively large.

Unfortunately, the tempco is not linear. That is to say, if we plot resistance against temperature we obtain a curved line, not a straight one. As temperature increases, the resistance decreases more and more slowly. This means that a thermistor is not suited for circuits that are to measure varying temperatures within a given range, unless the range is small. Nevertheless, they are fine for spot values, because the thermistor always has a specific resistance at one particular temperature.

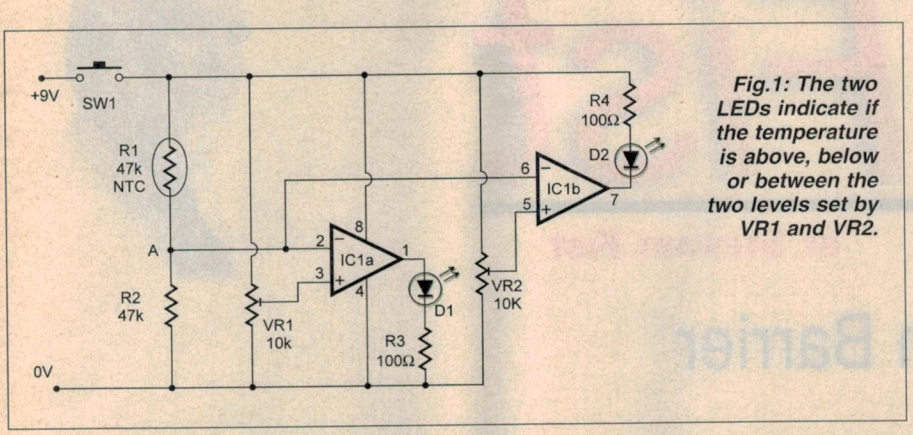


Fig.1: The two LEDs indicate if the temperature is above, below or between the two levels set by VR1 and VR2.

In Fig.1, we use a thermistor (R1) that has a resistance of 47k at room temperature (25°C). Because this project will most often need to operate in similar temperatures, we choose a fixed resistor (R2) of the same value to wire in series with this. At 25°C the resistors are equal in value and the voltage at point 'A' is exactly half the supply voltage. If the temperature increases, the resistance of R2 changes so little that we can ignore it. However, there will be a significant drop in the resistance of R1. The result of this is to raise the voltage at A. Conversely, a fall in the temperature of R1 causes the voltage at A to fall.

IC1a is an operational amplifier wired as a comparator. It compares the voltage at A with the voltage at the wiper of the trimpot VR1. The op amp has very high gain, usually around 200,000 times, so if the voltage at the wiper differs even slightly from that at A, the output of the op amp swings sharply toward the voltage of the positive or the ground rails. The way it swings depends on which of its two inputs is at the higher voltage. In the circuit of Fig.1:

It swings toward the positive rail if the wiper voltage is greater than the voltage at A.

It swings toward the ground rail if the wiper voltage is less than the voltage at A.

The first case occurs if the wiper voltage is first set to equal the voltage at A and then the temperature falls. For IC1a, the rising output turns D1 on. We must set VR1 so that this happens when the temperature is at lowest limit of the range. Then, D1 is on whenever the temperature is above the lower limit. It may be within the agreed range or above it.

IC1b is the second op amp of the pair. It is connected to point A but has its own trimpot (VR2) to set the upper limiting temperature. D2 is wired so that it indicates the opposite action, which results from the second case above. VR2 is set to the upper limit of the range. When the temperature falls below this level, the output of IC1b swings down toward 0V. Current flows through D2 and turns it on. Therefore, D2 is on whenever the temperature is above the upper limit.

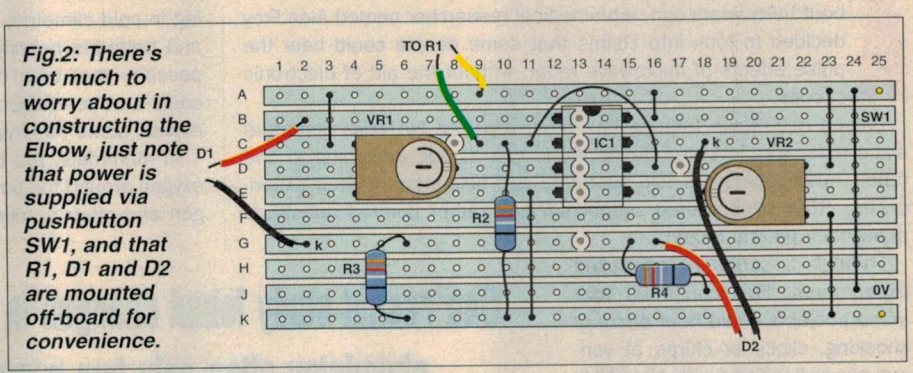


Fig.2: There's not much to worry about in constructing the Elbow, just note that power is supplied via pushbutton SW1, and that R1, D1 and D2 are mounted off-board for convenience.

The readout from the LEDs can be summarised like this:

Temperature	D1	D2
Above higher limit	ON	OFF
Between limits	ON	ON
Below lower limit	OFF	ON

Therefore, it is safe to bath the baby only when both LEDs are on.

Construction

The circuit runs off 9V, so you can power it from either six AA or AAA cells in a battery holder or from a 9V PP3 battery. The latter is more suitable if you are building it as a small probe-like device. There are several types of thermistor available from suppliers but be sure you buy the NTC type, NOT the PTC kind. The exact value doesn't matter but, if you have one that has a resistance other than 47k (at 25°C), substitute a resistor of equal value for R2.

The circuit board is small enough to fit inside one of the miniature plastic enclosures intended for hand-held equipment. Some types have a built-in battery compartment, which is useful. If you want to build this as a probe-type instrument, you could bore a hole at one end of the enclosure and glue in a short length of stiff plastic tubing (fishtank aerating tubing, for example, or a scrap of model-maker's polystyrene tubing).

Solder insulated leads to the thermistor and thread this through the tube before gluing the thermistor to the end of the tube. Apply plenty of glue to the thermistor so that it dries to form a waterproof seal. A clear adhesive such as Uhu is suitable for this, or use a two-part setting epoxy-resin glue.

The circuit is best assembled completely before you test it. Take care with the polarity of the LEDs. With most types, the anode is the longer of the two wire leads and the cathode (k in Fig.2) is the shorter. The rim of the LED is usually flattened at the edge closest to the cathode lead.

One or both of the LEDs should light when power is switched on. If neither lights, check the wiring again. Place the thermistor at the lowest temperature in the acceptable range. A glass of tepid water could be used for this. Adjust VR1 until D1 is just on the borderline of being ON and OFF.

Next, put the thermistor where it is at the high end of the range. A glass of rather warm (but not hot) water can be used. Adjust VR2 until D2 is just on the borderline between ON and OFF. Now test your settings by immersing the probe in water that is cold, water that is within the range, and water that is a little warmer than the acceptable range. The LEDs should indicate as in the table above.❖

Parts List

Resistors

(5% 0.25 W unless otherwise specified)

R1	NTC thermistor, 47k at 25°C
R2	47k (or equal to R1)
R3, R4	100 ohms
VR1, VR2	10k mini trimpot

Semiconductors

D1, D2	Red or green LEDS
IC1	TL072, dual JFET opamp

Miscellaneous

S1 Any low-current switch; Stripboard 64 x 26mm (10 strips x 25 holes); 8 x 1mm terminal pins; 8-pin IC socket, battery clip or 6-cell battery holder.

OPEN Fist

BY STEWART FIST

The Blood-Brain Barrier

About thirty years ago, a biomedical researcher named Alan Frey decided to look into claims that some people could hear the pulse effects of microwave radar, without the aid of electronic circuits.

Pulsed microwave hearing has been reported by radar operators since radar was invented during World War II. But, according to one report, when observers told superiors and scientists of their experiences, "they encountered scepticism and rather pointed questions about their mental health".

Through a series of controlled experiments, Frey confirmed that some subjects could hear buzzing, knocking, clicks or chirps at various power densities with 1310MHz and 2982MHz microwaves. To the subjects, it appeared as if the sounds originated from within, or near to, the back of the head.

One recent study found changes in brain chemistry after only two minutes of cellphone-level exposure...

By 1975 this microwave acoustic phenomenon was being described by Dr Bill Guy, a key researcher for the US Air Force, as: "One of the most widely observed and accepted biological effects of low average-power electromagnetic energy."

Apparently cats can hear it also, and tests on these animals showed that it is probably related to some form of direct stimulation of the auditory nerves, although some scientists continue to believe the cause may be very small local thermal-expansion effects.

Frey wrote in a 1988 article that "It was assumed that the only way the energy could affect an organism was through overloading its heat-dissipation mechanism. Thus, little effort was expended to determine the effect of low-intensity energy."

In a speech entitled: "Headaches from Cell Phones: Are They Real?" Frey reported that while studying this phenomenon of microwave hearing, numerous subjects also complained about headaches; to the point where: "I was sufficiently concerned about the headaches to stop research with humans." Frey was using fairly substantial power-densities in these tests.

This was yet another subjective RF/tissue interaction, but one that proved more difficult to test. With microwave hearing, a transmitter switched on and off, and they would report immediately if they experienced acoustic sensations. With headache research, the tests were more variable. In many cases, those who complained of headaches didn't get them every time.

Police radar was one new form of transmitter that came under scrutiny here during these years, and then when cellphones came along (especially some of the early high-powered analog handsets and transportables) there was a rash of reporting — along with stories of hot hands and hot ears after only a few minutes of use.

Some sensations were clearly the result of classic microwave-warming in cold climates, and some were probably due to the electronics and batteries heating during discharge. However, it is now thought possible that both the headache problem and the hearing effects could be due to changes in the blood-brain barrier, which might also explain some observed changes in animal behaviour.

In mammals, the blood contains large red corpuscles which carry oxygen around the body. These blood serum and corpuscles carry oxygen and other nutrients through arteries to the organs and tissues, and the molecules exchange across the walls of the finest capillaries. The blood then circulates back through the veins to the heart and lungs carrying waste products.

In order to keep red corpuscles within the blood stream the single-cell-thick walls of capillaries are modified to perform two filtering/transport functions;

1: Oxygen, glucose, and all essential proteins needed for the body to function transfer across the capillary walls, and lactic products resulting from the generation of energy transfer back for carriage to the lungs, kidneys, etc. This appears to be largely a passive osmosis process.

2: Simultaneously, the small disease-fighting white corpuscles are transported from the blood through special inter-cell gaps in the capillary walls, to the surrounding tissues in order to scavenge dying cells and attack alien viruses and bacteria. This is an active process involving selective transfers.

The serum and white corpuscles then permeate through the muscles and connective tissue and return through the lymph system, entering the blood stream once again through the thoracic duct

Modified capillaries

This twin-path circulation process works well for most of the body, but the capillaries feeding the brain have been modified even more because they must prevent the transfer of many of the serum's protein molecules and some of the blood corpuscles. Presumably, these could damage highly sensitive brain tissue.

This selective filtering is called the blood-brain barrier (BBB) and it distinguishes the capillaries which feed the brain from those in the rest of the body. What appears to characterise these vessel walls is that the junction between cells are extremely tight, and also that a highly selective transfer mechanism exist to handle the few larger molecules which the brain requires.

The brain is a very substantial consumer of energy, and these are very small blood vessels. So in the human brain, there are approximately 640 kilometres of capillaries with a total surface area of about 9 square metres,

Bio-electrical researchers measure the ability of membranes to

block ionic transfers in electrical terms, and the resistance across cells lining the vessel walls is normally as high as 8000 ohms per cm2. So it is possible to see this as a very complex EMF-prone system — quite apart from the electro-chemical functions of brain neurones.

The brain needs special protection for a couple of reasons. While some cells in the body constantly divide and are replaced (in the skin this is every month or so), neurones must last most of your life-span. The way brain cells store memories, is through physical variations which are highly location-specific, so we don't really want them undergoing divisions, duplicating our memories every month or two.

What's more, white blood corpuscles tend to attack shapes that are alien to their experiences, so we don't want white corpuscles knocking off a few stray brain cells every now and again, because neurones take up many exotic shapes in storing memories.

Brain tumours arise mainly in glioma cells which are the brain's connective tissue and make up roughly 40 percent of the volume. These cells can divide, while the number of neurones we are born with, remain with us until we (or rather 'they') die.

Alan Frey believed that the headaches experienced by radio and radar operators (and now widely reported in cellphone users) stems from microwave-induced leakage of unwanted molecules through the blood-brain barrier. "Headaches may only be the most obvious indicator of what is going on biologically," he warned back in the mid-1980s.

Since his initial finding, both Dr Kjell Mild (a Swedish occupational health specialist) and Dr Bruce Hocking (once Telstra's chief medical officer) have reported links between excessive cellphone use and headaches. Mild also found that the type of phone made a difference.

When GSM was first being mooted back in 1986, Blackwell and Saunders suggested that it was likely that such time-divided pulsed microwave radiations, even at a low level, could significantly affect blood-brain barrier permeability. But this was never confirmed by research.

Usually the researchers irradiate mice, while injecting them with a tracer chemical of some kind, then kill the mice and autopsy them to see if the tracer has spread through the brain tissue.

Way back in 1975 Frey reported the penetration of fluorescein in rats after they had been irradiated with very low levels of both pulsed and continuous microwaves, and two replication of this work found a dose-relationship between the transfer and the microwave exposure. About a dozen studies since have found the same effect, but at different exposure levels.

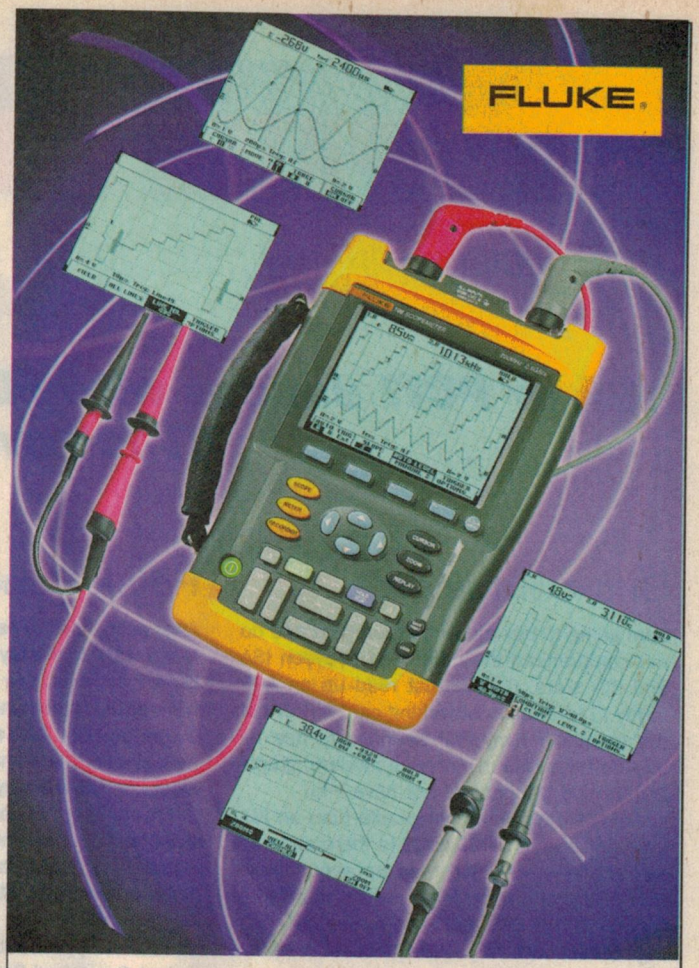
Chinese hamsters have shown tracer transfers at cellphone handset levels, in the 2-8 hours exposure range. However, it is claimed that the effect could have been due to tissue temperature increases.

One of the problems in studying the permeability of the barrier, is that they need to use special dyes or radioactive tracers, and, since this is a selective filtration system, the results may only provide evidence directly relevant to the tracer used. It may tell you that the barrier blocks the tracer, but nothing about normal proteins.

The world expert in this research is neurologist Dr Leif Salford of Lund University, Sweden, who has been studying blood-brain barrier changes since the late 1980s. He is worried about increased risk of developing Alzheimer's, multiple sclerosis and Parkinson's Disease because of unwanted toxins entering the brain.

With improved detection procedures and new tracers, one of his most recent studies found changes in the rat brain chemistry after only two minutes of cellphone-level exposures; the rats' blood-brain barrier had failed, allowing proteins to enter the brain, and it is known that certain proteins which are normally present in blood, can cause nerve damage in the brain.

So Professor Salford repeated his experiment and confirmed the finding: "We think we are on to something very significant," he says, and what makes this most worrying is that the levels of microwave exposure are certainly not strong enough to cause tissue heating.❖



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COMPUTER CLINIC

ISA or PCI? dances with FDISK, Partitioning problems, NT leftovers, and a cautionary tale...

Bus confusion

I am going to buy a new motherboard and do not comprehend the difference between ISA and PCI slots. (I have just read up on AGP today.) I know my networking card is PCI but the manual for my PnP sound card has no info on this. Also my internal modem, graphic card and I/O card do not have info.

Are the slots interchangeable (can an ISA card be used in a PCI slot)? Is there an internet site where I could read up about these things? I propose buying a motherboard with a PIII 450MHz CPU and hope to use my existing cards with my 32MB SDRAM. (Ken Watson, by email)

Ok, it's quite simple... ISA is the oldest type of slot you'll see on motherboards today, a 16-bit bus that dates back to the early years of the PC. It's not used for very may peripherals these days, except older soundcards and occasionally modems — cards that don't need a lot of bandwidth, and ones that date back before PCI became the de facto standard. Pretty much all motherboards still have a couple of ISA slots to accommodate these, just in case.

PCI, on the other hand is 32-bit, and an awful lot faster. As for telling them apart, ISA slots are long, black, with widely-spaced conductors, whereas PCI slots are white, short and very compact — which also answers your compatibility question... A card designed for one slot simply won't fit in the other type of slot. I don't know how old your existing system is, but if you have a lot of old ISA cards you might not have enough suitable slots for them in your new motherboard, so this is something to make sure of before you upgrade.

As for your 32MB of RAM... Yep, it'll work fine, though 32MB is a little underpowered these days. If you're running a processor that fast, then the amount of RAM available will definitely be the bottleneck in your system — I'd suggest another 32MB to get decent performance out of the thing. As for websites, I'd suggest you take a look at **http://www.mkdata.dk/click/** — there's some handy info there.

Fdisk Fandango

After using fdisk to partition my hard drive into two, I want to get my hard drive back to what it originally was. I've reached a point where I have gotten stuck and end up with error messages that say that either the disk could not be locked or the primary DOS partition already exists. Is there a way of doing this?

I'm running Windows 98, my hard drive is 6.4G and queries under fdisk and the control panel show that it is half this capacity (what I set it to under fdisk originally). (Stephen Harrison, by email)

Ok... first up, reboot, holding down Ctrl, and select Command Prompt Only from the boot menu. If you're getting problems with locking, then windows could be to blame. Now run Fdisk, enable Large Disk Support, and ensure you have your new drive selected, using option 5, 'Change Current Fixed Disk Drive' from the menu.

Now start deleting all your partitions, starting with any logical drives you might have defined, then the extended partition, if it exists, followed by the primary DOS partition. Your drive should now be completely blank, and you're ready to start again from scratch.

Create a primary DOS partition, using all the available space, and exit FDISK. Reboot into windows, and you should see your new drive in Explorer, ready to format.

Fdisk again

Could you please complete last month's fdisk column by telling us how we'd partition a disk with more than 4GB? I don't know how to do it and I've never had to do it. But I do know 4GB drives are almost history and fdisk will only allow one extended partition and one primary partition — each of 2GB max, as you say. (David Hawcroft, by email)

Ah. I seem not to have been sufficiently clear. While the primary DOS partition has a maximum size of 2GB, the Extended partition can and must be extended to take up all the remaining space on the drive. You then create as many Logical Drives, each with a maximum size of 2GB, as you want, *within* the Extended partition. Thus you only ever have two partitions, but one of them is subdivided into a number of pieces.

So in the case of a 6GB drive, you'd make a 2GB primary, a 4GB extended (it's only the actual filesystem that has a size limit) and divide the extended into two 2GB drives, resulting in a grand total of three 2GB drives. Of course, if you abandon FAT16 in favour of FAT32 (a practical necessity when you start dealing with really BIG drives), then the 2GB limit no longer applies, though the idea's still the same — one primary DOS partition containing the first drive, then an extended partition containing your logical drives.

NT remains...

I recently removed Windows NT4 from my computer system and returned to the joys of Windows 95, but I am still stuck with the OS Loader program that automatically tries to boot NT. Any ideas on how to get rid of the OS Loader? (R. DeCastro, by email)

Sure have... Make a Windows 95 startup disk (from Control panel | Add/remove Programs | Create Startup Disk), and boot off it. Now SYS C: then FDISK /MBR. Reboot again, and you should be right, but you really ought to get rid of a few files that are evidently left over from your NT installation.

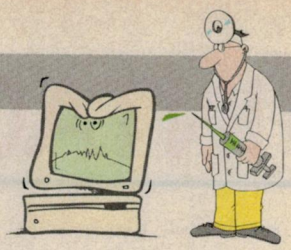
They'll be marked hidden and system, so you'll need to ATTRIB -HS each file before you DEL it. The files are BOOT.INI, NTLDR, NTDETECT.COM, BOOTSECT.DOS and PAGEFILE.SYS — the entire C:\WINNT directory should be gone, too, but I'm assuming you already deleted that... Oh, and also C:\PROGRAM FILES\WINDOWS NT should go, along with anything in C:\TEMP, as well.

A cautionary tale

I just thought I'd pass this on — it shows how you can't win against Microsoft, no matter how ingenious you are...

I was recently involved in an upgrade on some NT boxes out in the field — this involved installing an extra DIMM, a network card, and some software upgrades stored on

by Jean-Baptiste Cattley



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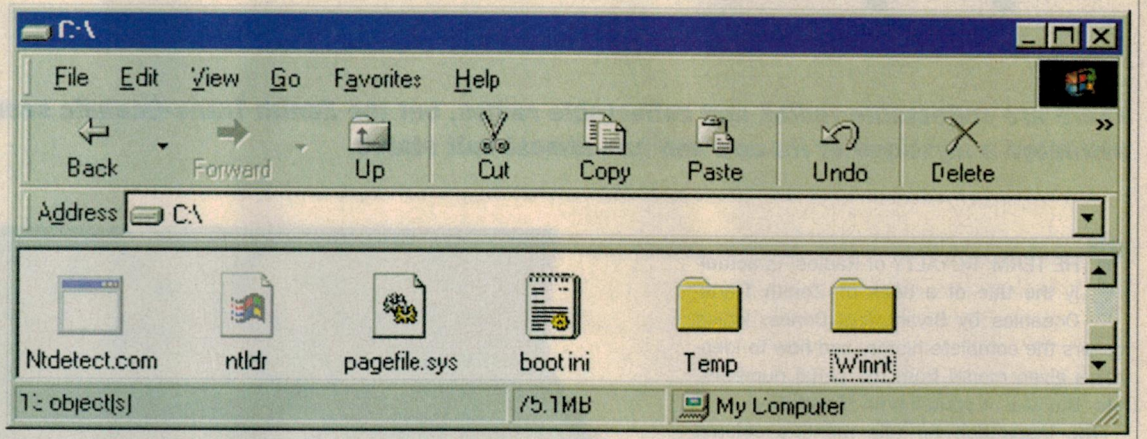


The files NT leaves behind...

my portable hard drive (there weren't any CD-ROMs available on the boxes, so I carry around a drive with everything pre-loaded — it's the fastest and easiest way to get big files onto a new system).

Anyway, after sticking the new hardware in, installing my drive as a slave and then running the upgrade script, it was time to apply Service Pack 5.

Well. As you may know, if you've ever applied a service pack, it takes quite a while, and I was getting impatient. So, three quarters of the way through, I started rummaging round the back of the computer trying to plug in the network cable.

Never do this.

You know what happened, of course... with 80% of the system files replaced, the power cable fell out. This is somewhat akin to the surgeon walking off halfway through a major operation. When the machine was rebooted, it crashed and burned with a bluescreen halfway through the boot process, which was annoying, to put it mildly. The machine was also needed rather urgently and I realised that it was a two hour trip back to the office....

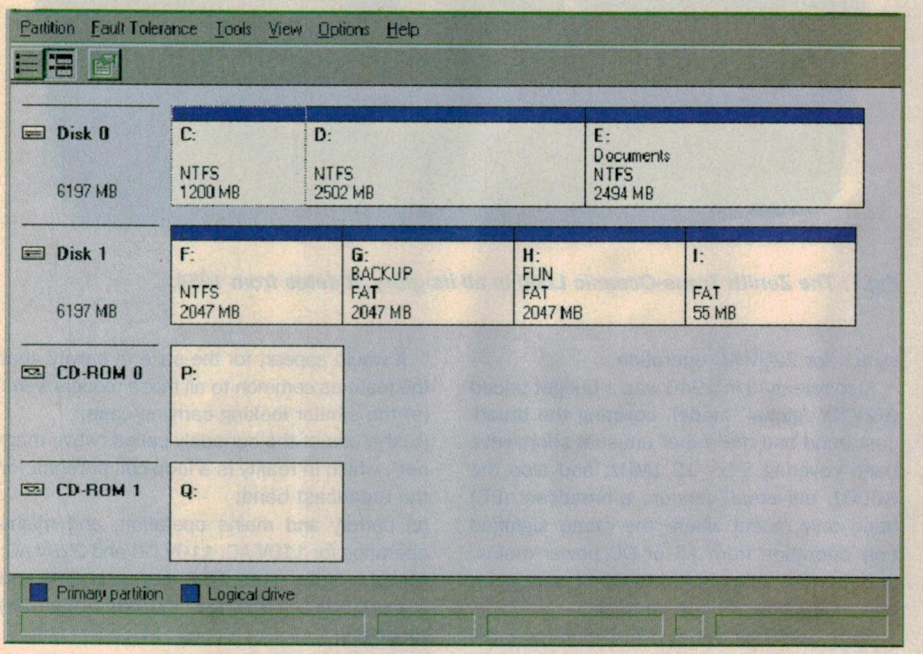
After a short pause to verbally remove the wallpaper from the walls, I considered my resources. Now, there's a way to restore a bungled SP install: doing a Repair install, using the NT boot floppies. This can get virtually any system up and running, though you'll want to reapply the Service Pack immediately as the state of the resulting system is a little odd, to put it mildly.

Unfortunately, I didn't have a set of boot disks with me, but (McGyver would have been proud of me) the upgrade drive I was carrying happened to be bootable, and had an i386 directory on it, *and* I had some left-over driver floppies from the network cards in my briefcase.... It was bound to work!

Though I didn't have the NT install CD to restore the files from, there was an i386 directory just sitting there on my hard drive — what more could it take?

I swapped drives over, booted up, made the boot floppies, swapped the old drive back in, and ran the repair install... after 10 minutes of loading drivers, it prompted for the location of the i386 files — on the non-existent CD. The nice people at MS didn't consider that you might not have the CD to hand, and the installation just can't go any further without the actual media — even though you have the all the files just sitting there on the hard drive.

This is another one of those times I almost wish I were a Mac user... Nah, wouldn't have anything to fix if I did that...❖



Of course, everything's so much easier with Windows NT... no more fiddly little text menus, though the concept remains the same. (And yes, I know it's a lousy partitioning scheme. I had my reasons at the time, foolish though they were.)

VINTAGE RADIO

by Roger Johnson

The Zenith Trans-Oceanic: 'Royalty of Radios'

There are collectable radios and collectable radios, but the Zenith Trans-Oceanic seems to have attracted a mystique of its own and has almost cult status.

THE TERM 'ROYALTY of Radios' is actually the title of a book on Zenith Trans-Oceanics by Bryant and Cones, which covers the complete history and how to identify a given model from the serial numbers, etc. But alas it contains no circuits.

The inspiration for this month's column actually came about when I was requested to repair a Trans-O. At that stage I had never actually seen one of these sets, let alone had any experience using one. So it was a matter of searching the internet, to see what information was available, troubleshooting tips and so on.

Having had to go through this research and then tackle the job, I thought it would be a waste not to pass on what I found. If you too have an interest in vintage radios I think you'll find it quite good reading.

Background

Punching 'transoceanic' into my search engine came up with the goods. The brief history that follows is largely taken from 'Padgett's Trans-Oceanic Page' (dot com?). So too did a reprint of the US Army Technical Manual for the military version, called the R520B!

An exact circuit for the model concerned, alignment instructions and coil assembly lay-out was obtained from a mail-order house in the US, whose e-mail address was found whilst browsing the net.

Trans-Oceanics were first released by Zenith in 1942 as the 'Clipper Deluxe' model 7G605 covering six bands: the AM broadcast band, and then five bandspread shortwave bands, viz. 49M, 31M, 25M, 19M and 16M. Production was suspended in April 1942 for wartime committments.

Post war, the model 8G005 was released from 1946 to 1949, covered the same wavebands, and according to the research material, had 8 'loctal' tubes. It was this model that had the optional adapter and switch for 220V AC operation.

Fig.1: The Zenith Trans-Oceanic L600 in all its glory. It dates from 1954.

Also released in 1946 was a budget priced G6004Y 'global' model, covering the broadcast band and the rather unusual short-wave band covering 9.5 - 12.1MHz; and also the G6001 'universal' version, a broadcast (BC) band only model where the name signified only operation from AC or DC power mains, or batteries. Sales of the 6G004Y were poor, and production did not continue.

From 1950 to the end of the valve models in 1962, there are more similarities than differences. Assiduous collectors will no doubt identify and spot all the nuances at 100 paces.

It would appear, for the sake of brevity, that the features common to all those models were:

(a) the similar looking carrying case;

(b) the use of the curiously called 'wave magnet', which in reality is a loop-coil antenna for the broadcast band;

(c) battery and mains operation, and mains operation for 110V AC, 110V DC and 220V AC;

(d) tube types 1L6, 1U4, 1U5 and 3V4 and a type 50A1 'barretter' (current regulator) tube; and

(e) coverage of seven bands, namely BC, 2-4MHz and 4-8MHz general coverage/marine, and four shortwave bandspread bands for the 16, 19, 25 and 31 metre bands.

Construction & finish

Like most American gear of the era, it is bold, solid, artistic, looks-as-though-it-should-work and well put together. The carrying case is made of timber and standard models were covered in what we call 'leatherette' but Americans refer to as 'staghorn'.

There is a lift-up flap covering the dial and controls, and a hinged rear panel. Also included are comprehensive log charts. Deluxe models were covered in leather, but cost another US$20 to buy. (Trans-O's sold for about US$120 at the time — very pricey by contemporary Australian standards.)

Band selection is via self-cancelling push buttons. Included is a whip antenna for short waves, external antenna and earth connections, the 'wave magnet' which doubles as a direction finder, and a VERY effective series of four tone control switches referred to as the 'Radiorgan'. The single dial lamp is supplied with its own separate battery, pushbutton activated, and there seems no provision to operate the dial lamp from the external power source!

All in all, it is a most attractive unit, and whether the performance was good or otherwise, the very appearance just reeks of quality. American philosophy was that a top performer should look like a top performer. (I agree!)

Additionally, all components were treated against moisture and other climatic conditions to enable it to obtain optimum performance anywhere in the world, regardless of the prevailing climate.

Incidentally the 'wave magnet' has a special extension cable, and is detachable from its position in the case to enable it to be placed against the window of cars, planes or trains.

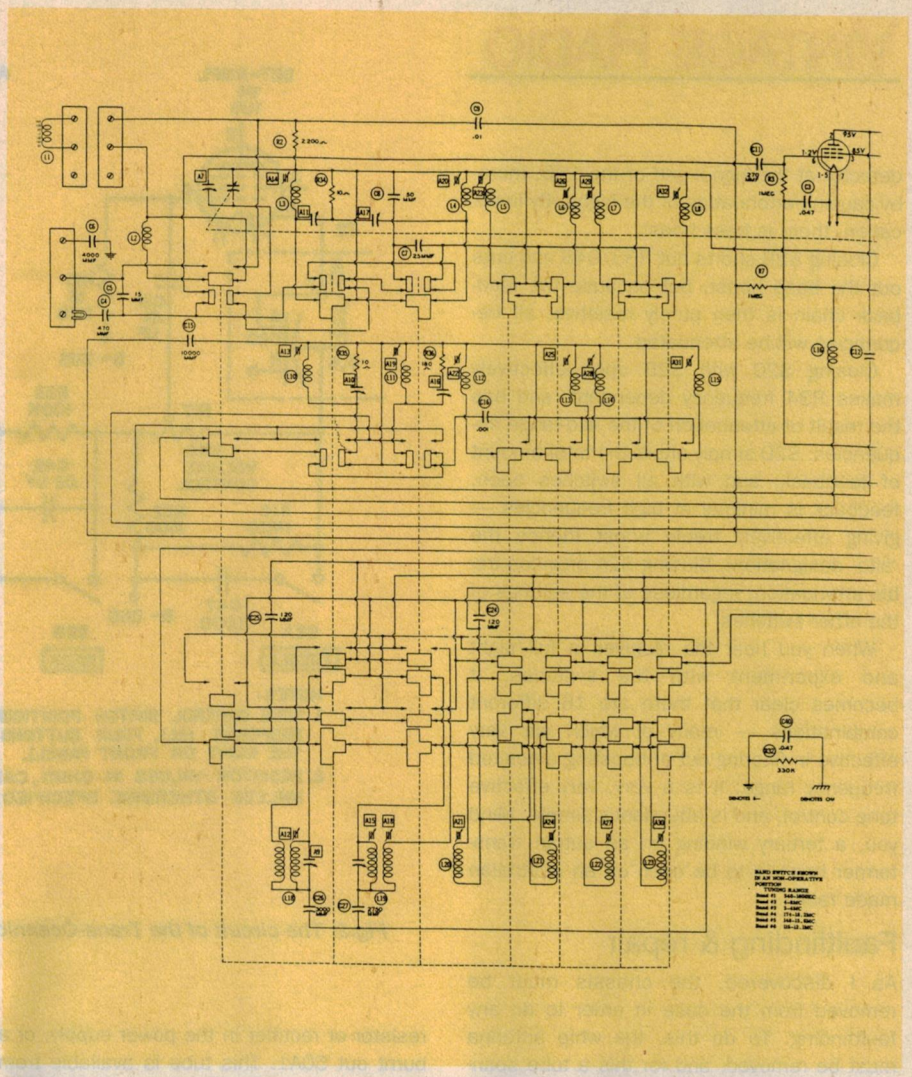


Fig.2: The complicated band switching of the L600's front end.

The circuit

The model which I was asked to repair was an L600 (chassis type 6L40) of 1954 vintage. Apparently, this model is similar to the military version. The circuit is a well designed five-tube superhet consisting of a type 1U4 tuned RF amplifier, a type 1L6 mixer/oscillator, a 1U4 as 455kHz IF amplifier, a 1U5 detector/audio amp, and a 3V4 in the output. The power supply is transformerless, consisting of a half-wave selenium rectifier with current regulation for the series-connected filament chain via the 50A1 barretter.

As mentioned the wavechange facility is via self-cancelling pushbuttons in an extremely complex switching arrangement. Each switch bank consists of two rows of up to 12 pairs of contacts, and in the actual switching, carefully designed connecting bars connect between selected groups of contacts, such that adjacent pairs are connected to each other, connected to opposite contacts, or become open circuit, and in the process connect the correct coil in circuit and in some cases, short-circuit coils that are not used. The front end is shown in Fig.2 to give an idea of the complexity.

Although complicated, the front end doesn't hold any real surprises. Moving on, though, we find a rather unorthodox IF amplifier. Instead of supplying the screen of the 1U4 via a normal dropping resistor of around 20k and bypassing it with the time-honoured 0.1uF, the designers 'decoupled' the anode circuit with a 1k resistor and a 3nF capacitor. The screen and the cold side of the IFT are supplied from this point.

In reality, the 3nF capacitor in conjunction with the 1k 'isolation resistor' provides a feedback path to the screen, to neutralise the signal grid-plate capacitance. With a carefully chosen value of capacitor (3nF), the gain of the IF amplifier can be increased considerably without causing it to self oscillate.

The tone control

The 'radiorgan' tone control is also very unorthodox, but very effective. An exploded diagram is shown in Fig.3. It depends on an inverse feedback voltage obtained from a tertiary winding on the output transformer, fed back to the volume control. (Let's hope the set doesn't have any difficulties here, because a special trensformer core would have to be re-wound in the event of an open-circuit primary.)

The diagram shown is taken from the military version, but is in every way similar to the 6L40 apart from part numbers. The tone control resistor-capacitor network consists of R16, R17, R32, R33, R34, R35 and capacitors C47, C48 and C49. R32/33/34/35 form a voltage divider across the tertiary winding of T3.

The function of the four switches is to alter the R-C network frequency characteristic, which results in a change to the audio response. C48 in parallel with R33 makes the network frequency dependent. When the S2B 'Bass' switch is open, as well as S2D being open, C48 in effect reduces the value of R33 at the higher frequencies. The out-of-phase higher frequencies appearing at the junction of R17/32/33 are increased, and are mixed with the high frequencies from the

detector at the signal grid of the 1U5, thereby causing attenuation of the highs. By implication, there is bass boost.

Closing S2B shorts out R33/C48 and cuts out the bass boost, but because the feedback chain is then purely resistive, all frequencies will be attenuated.

Closing S2C with S2B open effectively makes R34 frequency dependant, and has the result of attenuation of the mid-range frequencies. S2D simply alters the total amount of feedback, and with all switches open, feedback is minimal at high frequencies — giving effectively treble boost (hence the 'alto' designation). Closing S2A provides treble attenuation, regardless of the settings of the other switches.

When you hear the receiver in full flight and experiment with the switches, it becomes clear that there are 16 different combinations — many of which are very effective in filtering out or boosting a desired frequency range. It is a very, very effective tone control, and is abundantly simple. Mind you, a tertiary winding on an output transformer has yet to be seen on an Australian made radio!

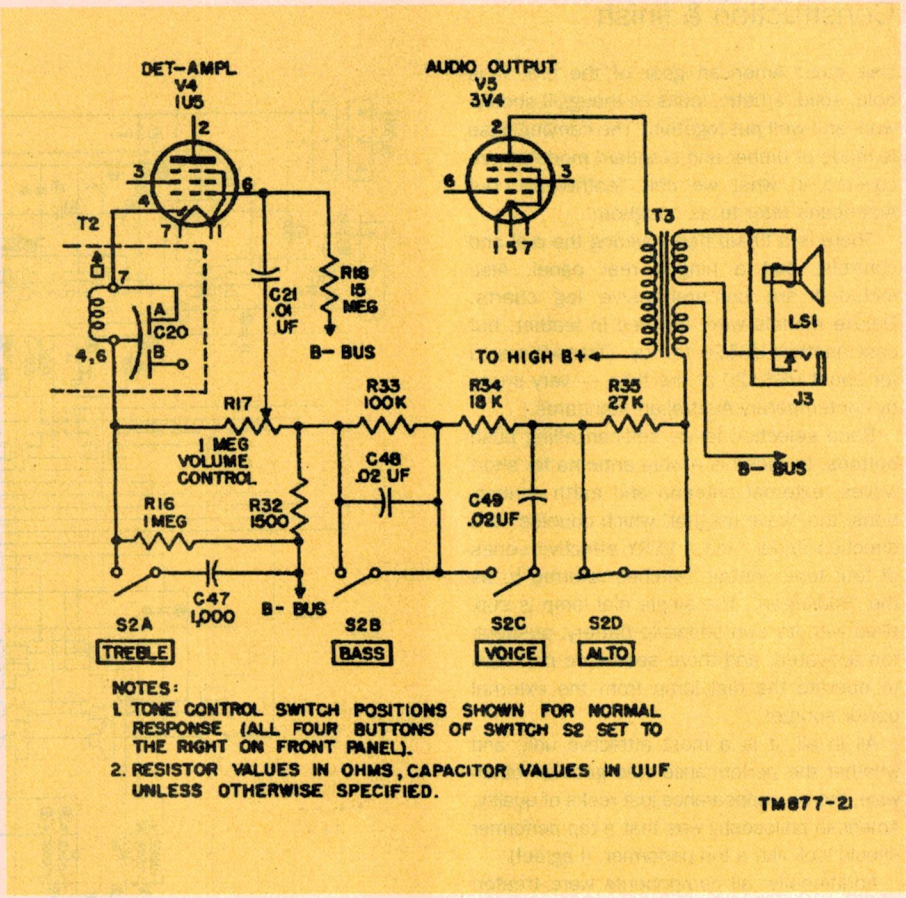


Fig.3: The circuit of the Trans-Oceanic's 'Radiorgan' feedback tone control, which is surprisingly flexible and effective.

Faultfinding & repair

As I discovered, the chassis must be removed from the case in order to do any faultfinding. To do this, the whip antenna must be removed, and for this a tube spanner is required. The mains plug needs to be removed as well.

There are two self-tapping screws holding the chassis to the shelf of the battery compartment. The dial lamp also needs to be removed from the chassis, as its wiring is integral with the cabinet...

If your set is like the one I tackled, the power supply is probably going to be the most likely source of trouble. There is no transformer, and the mains input unit is nothing more than two resistors, a linkpin to select input voltages and a diode in an air-cooled cage.

There is an additional diode in this model. The link pin leaves the cage diode out of circuit for 110V AC or DC operation, and then selects voltage dropping resistors for 220V AC and for DC. There are in effect two diode rectifiers in series, and after filtering, at the cathode of barretter M1 the stated voltage is 115V. The 50A1 drops the necessary 95-odd volts to the series connected filaments, which draw 50mA.

The chassis is isolated from B-, which means a suitable point in the power supply must be found in order to read voltages. Potential trouble spots are a burnt-out 130W resistor or rectifier in the power supply, or a burnt out 50A1. This tube is available from the US, but at a healthy cost (about A$50). There is a solid state replacement which is available at a lower cost, and it appears that some repairers have merely replaced it with a suitable resistor.

This latter course is most inadvisable unless great care is taken to determine the resistor's precise value. To do this, the tubes should be removed, and 27Ω resistors poked in socket pins 1 and 7 of V1 to V4, with a 56Ω resistor poked in pins 1 and 7 of V5. This represents the actual filament load placed on the barretter or its substitute resistor. The substitute resistor can then be carefully adjusted until the voltage across the filament chain is precisely 9.0 volts.

If you are replacing M1 with a solid state diode, a higher voltage may be obtained, and a wise precaution would be to go through the exercise just described, and if necessary, increase the value of the 130Ω voltage dropping resistor R31.

Alignment

Although quite precise alignment instructions are available, my advice is that if the set works, and works well, LEAVE WELL ALONE! All sorts of difficulties can be expected, especially if you're not experienced and well seasoned in the gentle art.

Indeed, in the receiver under test, in daylight hours and with only about six feet of antenna trailing along the floor, many many shortwave stations were received at a healthy volume. Additionally, no shortage of AM stations were received on the broadcast band, with the 'wick turned up'. Given that this is essentially a battery set with about 240mW of audio output maximum, it was decided that performance was unlikely to be improved.

In this sort of situation, attempting any realignment would be a hiding for nothing. Of course, if some well-meaning meddler has already 'had a go' and the performance is poor, then there is no alternative...

Performance

The foregoing should have well and truly primed the reader to expect excellent results, and excellent results they are.

In fact the performance of this set is nothing short of brilliant. The bandspread facility almost puts it in the 'communications' class of receiver. It is little wonder that the Trans-Oceanics have been dubbed the 'Royalty of Radios', and their place in history is assured. ❖

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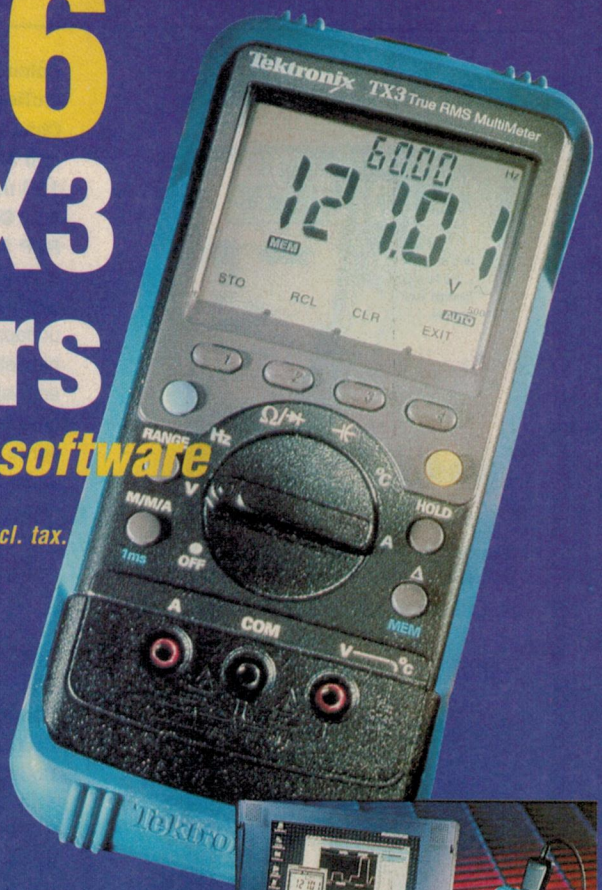

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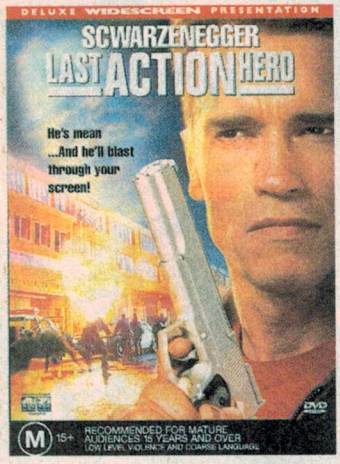
LAST ACTION HERO



Columbia, 1993. Directed by John McTiernan, with Arnold Schwarzenegger, Charles Dance, Austin O'Brien, Art Carney and Anthony Quinn. Widescreen, colour, 125 minutes. SS/DL disc, Dolby Digital 5.1. Columbia TriStar Home Video, M15+; RRP $34.95.

Arnie's action-packed movies are usually pretty enjoyable, mainly because our unflappable muscle-bound hero doesn't take himself too seriously. This one's even more enjoyable than most, because it's basically an over-the-top comedy spoof of the same genre — with even more explosions and shootouts than usual, interwoven with all kinds of references (both visual and in the dialog) to other popular blockbusters.

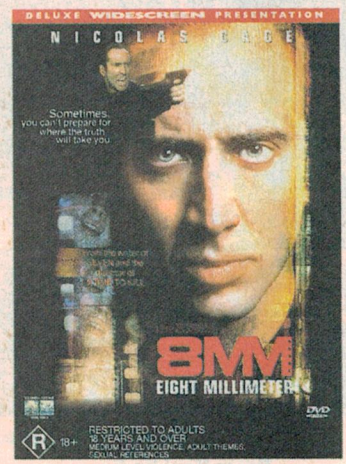
The overall picture quality in this Sony Gold Standard DVD transfer is very good. The Dolby Digital 5.1 sound is very good too, with impressive effects in the surround channels. There are also 3-channel Dolby Surround tracks with French, German, Spanish and Italian dialog.

There's not much in the way of bonus extras, though: the original trailer, a six-minute 'Behind the Scenes' featurette (probably a promo made for TV), short filmographies of Arnie and McTiernan, and the music video *Big Gun* by AC/DC.

Overall, though, a very entertaining movie. If you're after a bit of good humoured wham-bang escapism, go for it! (J.R.)

Picture: ★★★★½
Sound: ★★★★★
Movie: ★★★★½
Bonus Extras: ★★★½★

8MM



Columbia, 1998. Directed by Joel Schumacher; with Nicholas Cage, Joaquin Phoenix. Widescreen, colour, 119m. SS/DL disc, Dolby Digital 5.1 surround. Columbia TriStar Home Video, R18+; RRP $34.95.

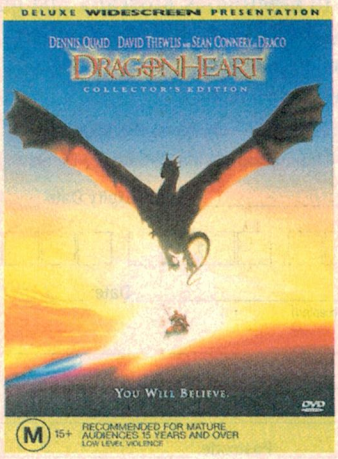
A very dark, almost gothic psychological thriller from director Schumacher (*Batman & Robin*, *A Time to Kill*). Nicolas Cage plays a private detective who becomes obsessed with tracking down a teenage girl's warped killers, whose crime comes to light in a 'snuff' movie after one of them dies. Strong and sordid stuff, but at the same time morbidly interesting because of the way it shows how easily law enforcers can be themselves corrupted. Cage puts in a top-notch performance, with good support from Phoenix as his 'guide' in the world of sleaze.

The picture quality is generally very good in this 'Gold Standard' transfer by the Sony Pictures DVD Center. The Dolby Digital 5.1 sound track is also excellent. The 'special features' are nothing spectacular, but there *is* a five-minute 'making of' featurette, the cinema trailer, a director's commentary track and filmographies for the director and main players.

Not for family viewing, but it's very well done — if you're into this kind of thriller. (J.R.)

Picture: ★★★★★
Sound: ★★★★★
Movie: ★★★½★
Bonus Extras: ★★★½★

DRAGONHEART: Collector's Edition



Universal, 1996. Directed by Rob Cohen; with Dennis Quaid, David Thewlis, Pete Postlethwaite, Dina Meyer, Julie Christie and the voice of Sean Connery. Widescreen, colour, 99min. SS/DL disc, Dolby Digital 5.1 surround. Columbia TriStar Home Video, M15+; RRP $34.95.

Producer Raffaella de Laurentis was involved in the creative side of this movie along with director Rob Cohen, and it turns out to be deeper and more substantial than the medieval 'knights and dragons' fantasy adventure it seems likely to be. The plot has lots of humour and good character development, and although the computer graphics 'dragon' Draco was developed by ILM from the T-Rex they did for *Jurassic Park*, it's really a big step forward. Not only does Draco have Sean Connery's voice, but a surprising amount of his on-screen persona as well. In short, it seems just as much 'alive' as the flesh-and-blood actors, all of which put in a solid performance as well.

The picture quality on this DVD transfer is generally very good indeed, and the Dolby Digital 5.1 sound track is excellent.

The 'special features' include a 44-minute 'making of' documentary, which gives a very interesting insight into the huge amount of work that went into both planning the film and developing the CG dragon character. There's also a feature commentary by director Cohen, production notes, cast and film maker notes, and both long and short trailers. The cover slick also mentions some outtakes, five TV spots and some 'archives', but these don't seem to be on the region 4 disc.

Overall it's very well done — an enjoyable yarn, and Draco is both an impressive CG achievement and very likeable as well. (J.R.)

Picture: ★★★★★
Sound: ★★★★★
Movie: ★★★★½
Bonus Extras: ★★★★½

New Books

Digital compression

DIGITAL VIDEO AND AUDIO COMPRESSION, by Stephen J. Solari. Published by McGraw-Hill, 1997. Hard covers, 236 x 158mm, 282 pages. ISBN 0-07-059538-0. RRP $141.95.

Digital compression of both video and audio is now an integral part of many emerging areas in electronics — digital camcorders, MiniDiscs, DVDs and digital TV to name a few. This book gives a fairly detailed description of how these compression systems actually work, and how they're used. The author is an engineer with C-Cube Microsystems, a well-known Silicon Valley firm specialising in the chips used for digital compression and decompression.

The general flow is from basic concepts of sampling through video scanning and systems, coding, the various video compression techniques (DPCM, transform coding and vector quantisation), sub-band coding, sound and audio compression. The last three chapters then deal with video compression standards, applications of compression and computer applications.

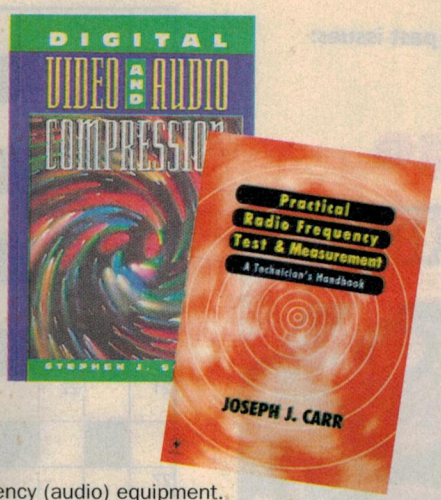
There's a lot of good factual information on video and audio standards, coding and compression, and this alone would make the book a valuable reference for anyone working or studying in this area. However the text is very concise — almost terse — in places, and there's a fair bit of maths used to 'explain' some of the basic concepts. Many of the diagrams aren't all that clear or helpful, either. So despite the claim that the book is intended for everyone from engineers to executives, my impression is that its value will be restricted mainly to engineers and advanced undergraduate students. For these people, though, it should make a good text and reference.

The review copy came from McGraw-Hill Book Company Australia, of PO Box 239, Roseville NSW 2069. (J.R.)

RF test and measurement

PRACTICAL RADIO FREQUENCY TEST & MEASUREMENT, by Joseph J. Carr. Published by Butterworth-Heinemann, 1999. Soft cover, 176 x 252mm, 348 pages. ISBN 0-7506 7161-0. Recommended retail price $62.95.

This book is about making measurements on radio frequency devices and in radio frequency systems, which as anyone familiar with RF will know, requires different techniques to making measurements on low frequency (audio) equipment.



For example, as the author points out, in some RF equipment the size of a component often approximates the wavelength of the signal being processed.

Like other books written by this prolific author (88 books), the approach is a mix of theory and application. The first half of the book deals with the theory, and includes two chapters on the Smith chart (it would be a contradiction to leave it out, says the author). If you can't manage the Smith chart, you might skip to following chapters, which cover signal sources, signal generators, spectrum and and network analysers. From there you're into actual measurement techniques.

The first topic is RF power measurement, in which power as a concept is described first, followed by coverage of typical RF power measurement instruments, including thermistor, thermocouple and diode detector RF power meters, along with typical commercial equipment made by Bird (yes, it's a US publication). A similar treatment of theory followed by application is used in the remaining chapters, which cover frequency and time measurement, noise measurement, and percentage modulation (AM, FM, PM) measurement.

Transmission line and antenna measurements are also covered, along with techniques to find a transmission line fault. However, while the book gives an excellent coverage of most aspects of RF measurement, it is still all rather theoretical. To this reviewer, the actual measurement techniques could do with a few photos and real instruments, instead of idealised drawings. After all, the RF world is a black art, and measurements never seem to go as per the text book.

The review copy came from Butterworth-Heinemann, PO Box 345, North Ryde 2113. (P.P.)❖

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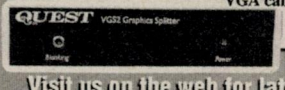

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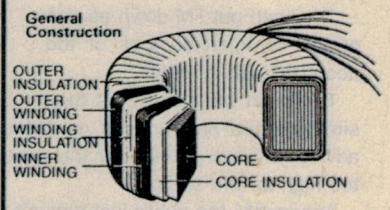

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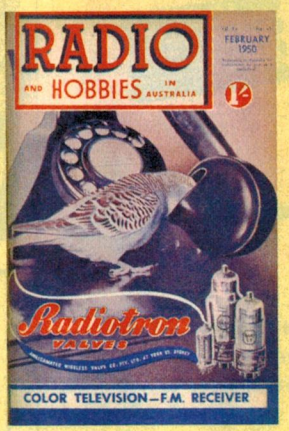
50 years ago

February 1950



F.M. Unpopular: According to latest reports, FM broadcasting seems to be taking a terrible beating in the USA.

"Today" says a correspondent, "the path travelled by FM is haunted by ghosts of broadcasters who took a whirl in the new medium. The ten-year tally sheet shows scores of failures, a few minor successes. The outlook - more fatalities to come."

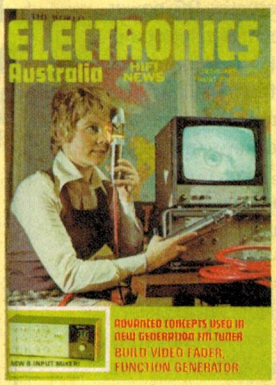
"You can put FM down as one of the commercial flops of the decade," says another.

The main trouble seems that in USA, the practice of running simultaneous programmes on AM and FM means that, as the advertiser pays nothing for the second channel, costs have run too high for the station.

Apparently, the public just doesn't appreciate the advantages of FM brought to them. In the eighteen months ending November, 1949, 220 stations ceased transmitting out of an estimated total of 1000. The mortality rate seems to be maintained. Many stations who obtained permits to operate never went on the air. It is reported that only a dozen stations now operating are making any money.

...25 years ago

February 1975



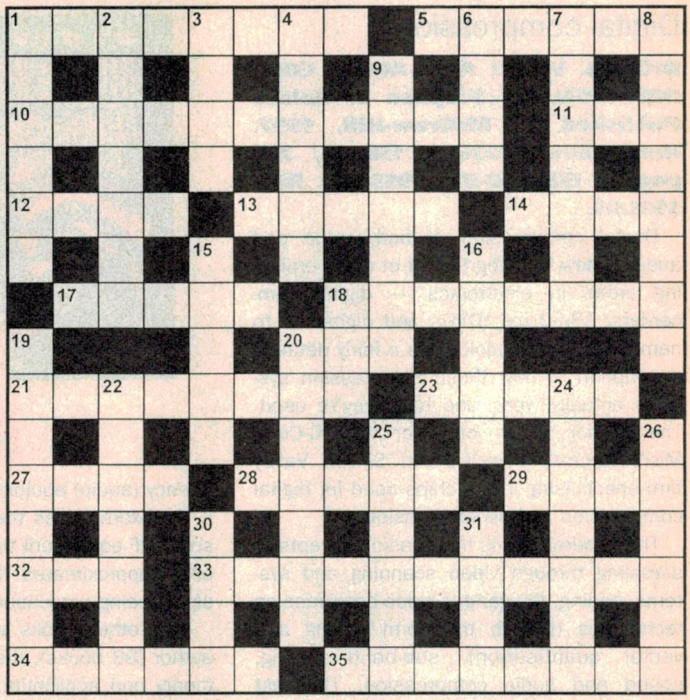
Voice warning system developed for jetliners: A new system that gives voice warnings of possible technical faults and operational errors may soon be in use in modern jetliners.

The new system, which uses a vocabulary of 25 words, is being developed by McDonnell Douglas Electronics Company, St Peters, Missouri. It is possible that the first units will be installed aboard the DC-10 jets manufactured by the parent company, McDonnell Douglas Corporation.

Audio-visual signals are already used to alert pilots of a problem such as reduced cabin pressure or engine fires, but the sounds are produced by various bells, tones and buzzers.

The voice backup is intended to reduce the time for interpreting the malfunction signals. It is a retrofit package to be added to the tone warning system - called Central Aural Warning System (CAWS) - which is already flying aboard the DC-10s. ❖

Crossword



ACROSS

1 Said of rectification with both half-cycles. (4-4)
5 Transistor with metallic basis. (6)
10 Said of an original carrier wave. (11)
11 Fixed store of information. (3)
12 Abbreviation for totalisator. (4)
13 Abrasive substance. (5)
14 Shortened form of junction. (4)
17 Common computer command. (5)
18 Range of frequencies rejected by a filter. (8)
20 Suffix used for ores and explosives. (3)
21 Said of range of frequencies with shorter wavelengths. (8)
23 Unit of radioactivity. (5)
27 Centimetric precision bombing system of WW2. (4)
28 An electrical unit is named after this Italian. (5)
29 Alternative word for soft UV radiation. (4)
32 Charged particle. (3)
33 Separated transmitted information from carrier. (11)
34 Transistor with metallic oxide basis. (6)
35 Said of simple form of AC rectification. (4-4)

DOWN

1 Breakdowns. (6)
2 Device that restricts output. (7)
3 Said of certain camera angle. (4)
4 Sound intensity. (6)
6 Circulating current. (4)
7 Mathematical operation expressed in symbols. (7)
8 System allowing identification of tape frame. (4,4)
9 Repeatedly perform steps. (7)
15 Controls on tuners, etc. (5)
16 Rough edge to diecast object. (5)
18 Abbreviation for national long-distance calls. (1,1,1)
19 Metallic element. (8)
20 Imparts knowledge. (7)
22 Connects to earth. (7)
24 An — switch senses its displacement. (7)
25 Method of surveying. (6)
26 Device named after Charles Wheatstone. (6)
30 Name of effect with capacitor plates. (4)
31 Symbol used in music notation. (4)

January's solution:

	E	L	E	C	T	R	I	C	W	I	N	C	H	
E		A		A		E		O		O		E		E
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C	O	S	H		T	I	R	O	S		D	I	A	C
T		A		F		R		N		V		N		T
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True-power detection IC for RF applications

Analog Devices, Inc. has announced an industry breakthrough in radio frequency (RF) integrated circuit (IC) design with the introduction of its AD8361 TruPwr Detection RF IC. The device is a patent-pending, true root mean square-to-direct current (RMS-to-DC) converter that operates at radio frequencies. It easily and accurately measures complex waveforms such as Code Division Multiple Access (CDMA) and Wideband-CDMA in wireless applications.

The AD8361 achieves instrument grade performance and accuracy at a fraction of the cost, size and power. It operates over a frequency range of 0.1 to 2.5GHz, making it a suitable choice for all worldwide cellular bands, and requires only a single power supply (2.7 to 5.5V). Prior to the introduction of this single-IC solution, measuring complex RF waveforms required multiple components and long design cycles.

"Precise measurement of signal levels is critical to nearly all RF design applications, such as radio links, cellular base stations and wireless termainals, filter-optic links, instrumentation and test equipment", said John Greichen, RF/IF marketing manager for Analog Devices. "In particular, this innovation solves a major challenge for CDMA and Wideband-CDMA designers. The AD8361 is a revolutionary achievement: a single, low-power IC that simplifies even the most difficult RF-signal measurements."

Specified over the industrial temperature range of -30°C to +85°C, the AD8361 TruPwr Detector is available in an 8-pin, micro-small outline package. For more information contact Analog Devices at Suite 4/1621 Point Nepean Road, West Rosebud 3940.

Interface chip for smart card readers

Linear Technology has announced the LTC1755, an inductorless smart card interface that offers the smallest and simplest circuit solution for smart card readers. It needs only two bypass capacitors and one charge-pump capacitor to interface seamlessly between a smart card socket and a host microcontroller.

The LTC1755 has a Vin range of 2.7 - 6V and provides 3V or 5V to the smart card, while on-chip level shifters allow connection to a low voltage host microcontroller. It consumes just 60uA (less than 1uA in shutdown) which provides considerable power savings for battery-powered applications. The 24-pin SSOP package minimises PCB area for compact portable designs.

Dynamic pullups on the three bi-directional channels deliver fast signal rise times when communicating with the smart card. This allows the required source and sink currents to be achieved independent of the input voltage on the transmitting side of the channel. During smart card deactivation, the LTC1755 discharges the supply pin within 100us. Rapid discharge is important to ensure that the card's supply is completely removed in the event the smart card is withdrawn during a transaction.

The LTC1755 complies with all EMV and ISO-7816-3 smart card standards and protects against all system faults, including short circuits, undervoltage and overtemperature faults. All smart card pins are rated for 10kV ESD, eliminating the need for external ESD protection.

For more information contact REC Electronics, Unit 1, 38 South Street, Rydalmere NSW 2116.

First leadless power MOSFETs

Vishay Intertechnology has announced what it claims is the industry's first power MOSFETs in a leadless, 1206 surface-mount package, with a total footprint of 3.05 x 1.8mm. The new Vishay Siliconix ChipFET power MOSFETs occupy approximately half the board area required by a leaded TSOP-6, allowing designers to shrink the power management circuitry for cell phones and notebook computers into about half the space previously needed.

Performance improvements with the new ChipFETs will be significant as well. Compared to TSOP-6 power MOSFETs, on-resistance in the new 1206 ChipFETs has been reduced by as much 35% and power dissipation has been increased by as much as 25%. On-resistance for the single N-channel Si5404DC, for example, is just 30mΩ max, with a power dissipation of 2.5W.

With an initial product offering of 10 devices in the 8-pin 1206 package, the new ChipFETs are available in 8V, 20V, and 30V versions with operating voltages as low as 1.8V. Both single and dual devices, including a dual N- and P-channel MOSFET in the same package, are available.

For more information contact Vishay Intertechnology, Inc, 63 Lincoln Highway, Malvern PA 19355-2120 USA. ❖

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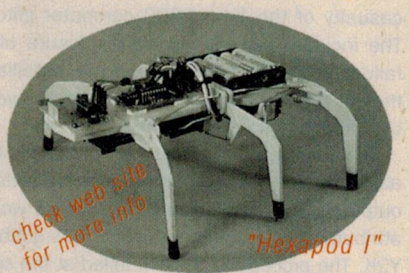

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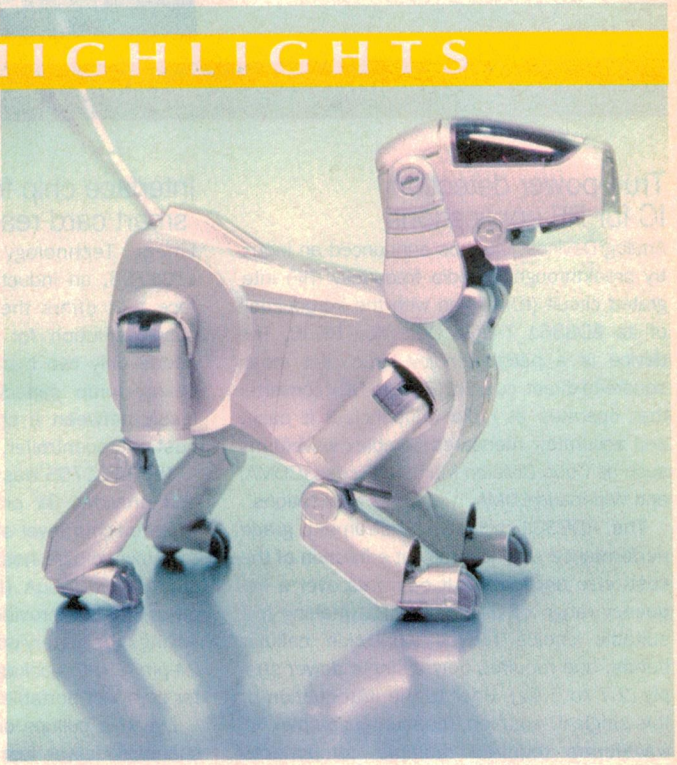


Powerhouse Museum's puppy

During the recent school holiday period, Sydney's Powerhouse Museum introduced their new acquisition AIBO, an automonous electronic dog developed by Sony, which the museum has called Pixel. Pixel has its own emotions and instincts, can walk and play, sit and stretch and has the ability to learn and mature. It learns by living and interacting with humans, and develops its own unique personality depending on how it is raised – it's said to mark the beginning of a new era in domestic pets.

"We have named our pup Pixel, as a dual reference to its digital nature and its diminutive stature. The Museum is very interested to observe how Pixel behaves and what type of personality it develops through its interactions with our visitors. We plan to extend Pixel's capabilities through the use of Motion Editing software, which will allow us to create and modify original behaviours for the robot," says Mr Tim Hart, Chief Information Officer at the Powerhouse Museum.

During the January school holidays the museum held training demonstrations where Pixel could interact and 'learn' from visitors. Once Pixel had fully matured it was put on permanent display in the Universal machine: computers and connections exhibition. Universal machine explores the origins, meaning and impact of contemporary information technology.

The AIBO electronic dog is significantly different from other robots because of its autonomous behaviour. This means that it has built-in functions for feelings, instincts, learning and growth. AIBO expresses emotions, communicates and can change its own behavioural patterns by learning and maturing through its contact and co-existence with humans. Like humans and animals AIBO matures by experiences and develops through stages, so as time goes by AIBO learns to understand its trainer's scolding and patting and becomes obedient.

AIBO is programmed with numerous emotions including happiness, sadness, anger and fear which are portrayed through sounds, motions and eye lights. If AIBO is in a bad mood, there is a chance that it will not pay attention to your orders but if AIBO is in a good mood, its eyes will sparkle and it may show you one of its favourite tricks.

In addition to the autonomous mode, AIBO has a performance mode and game mode. In performance mode, AIBO can perform many different tricks from scratching its ear and barking to dancing and waving its paws in the air. In game mode AIBO has a variety of motions, ranging from basic actions such as moving forward and backward to advanced actions such as playing robot soccer.

The Powerhouse Museum is at 500 Harris Street, Ultimo, Sydney.

US recovers spy system hit by Y2K glitch

The United States has recovered full use of a critical spy satellite system after a ground link feed failure, its most significant known casualty of the Year 2000 computer glitch. The incident marked a rare disclosure of a failure in the constellation of spy satellites that is at the heart of the $29 billion-a-year US intelligence establishment.

The Pentagon said the interruption of US ability to use the reconnaissance satellites' output was "a significant problem," its worst attributed to the computer design flaw dubbed Y2K. The processing system failed at the century date change, 7 p.m. Eastern Standard Time on Friday, or midnight Greenwich Mean Time – the standard to which aerospace networks are typically pegged. Deputy Defense Secretary John Hamre said the satellites had continued to operate normally, but for two to three hours "we were not able to process information from that system."

Although contingency procedures enabled processing to resume within a few hours, Hamre said they were doing so at "less than our full peacetime level of activity" until operations returned to normal. The Pentagon did not disclose which satellite system had been hobbled. Hamre said the "backup mode" was "fully acceptable in terms of meeting our high-priority reconnaissance requirements."

The glitch apparently interrupted access to the most advanced US eyes in the sky – the Air Force's Keyhole photographic reconnaissance satellites and Lacrosse all-weather imaging satellites, which uses radar to peer through clouds and darkness. The satellites are operated by the National Reconnaissance Office, a secretive Pentagon contracting agency overseen jointly by the director of central intelligence and the secretary of defense.

Richard Oborn, the NRO's director of corporate communications, declined comment on the location of the ground system hit by the Y2K glitch. "We don't talk about ground locations," he said. However, experts deduced the failure had occurred at the Defense Communications Electronic Evaluation Test Activity, a sprawling facility dubbed "Area 58" at Fort Belvoir, Virginia, an Army base near Washington. "It's definitely Area 58," said Jeffrey Richelson, author of America's Secret Eyes in Space.

John Pike, head of a space-policy project at the Federation of American Scientists in Washington, said Area 58 typically processes thousands of images a day, most of them archived for reference. The backup that kicked in over the weekend probably handled far fewer images but enough to meet the immediate needs of policymakers and intelligence analysts, he said. "To me the biggest deal is that they acknowledge (the failure)," he said.

AMD unleashes 800MHz Athlon processor

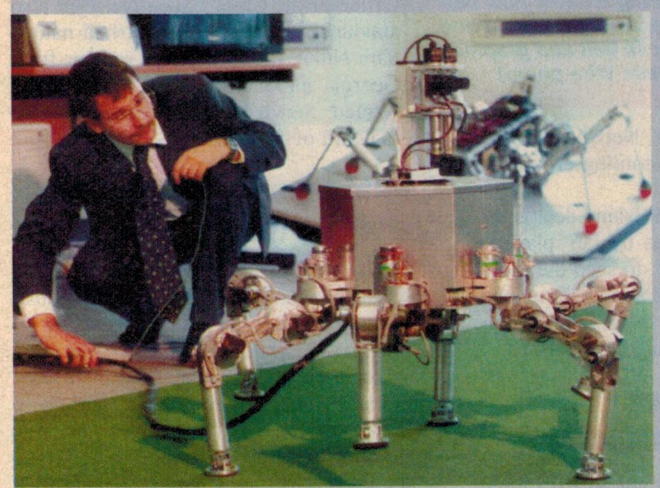
AMD has kicked off the new millennium by introducing an 800MHz AMD Athlon processor, only a few months after releasing their 750MHz version. Reportedly the world's first seventh-generation x86 processor, the 800MHz Athlon is manufactured on AMD's aluminum 0.18-micron process technology and is the industry's fastest and most powerful x86 device.

Leading OEMs, including Compaq and IBM plan to introduce computers based on the 800MHz AMD Athlon processor, as its performance capabilities and innovative enhanced 3DNow! technology promise users productivity increases for both commercial and consumer applications, theatre quality visual images, rich audio and an enhanced Internet experience.

The AMD Athlon processor feature a super-pipelined, nine-issue superscalar microarchitecture optimized for high clock frequency; the industry's first fully pipelined, super-scalar floating point unit for x86 platforms; high-performance cache technology, including 128KB of on-chip level (L1) cache and a programmable, high-performance backside L2 cache interface; enhanced 3DNow! technology with 24 additional instructions designed to improve integer math calculations, data movement for Internet streaming, and DSP communications; and the AMD Athlon system bus – a 200MHz system interface based on the Alpha EV6 bus protocol with support for scalable multiprocessing.

AMD and KryoTech have recently joined forces to demostrate a 1GHz system based on the Athlon processor. Using KryoTech's patented cooling system to thermally accelerate the Athlon processor, the Compaq Presario Internet PC was pushed to 1GHz to demostrate the system's capabilities to the public, at the Winter Consumer Electronics show (CES). Says Dennis Peck of KryoTech, "We're saying goodbye to the Megahertz world and 'Welcome to the Gig'." ❖

Robots in animal form:



This ready-for-patent mobile machine on six legs was developed at the University of Jena and the Fraunhofer Institute in Magdeburg, both in eastern Germany. The objective is to convey the locomotion possibilities of machines, a research area in which Japan and the USA are also working intensively.

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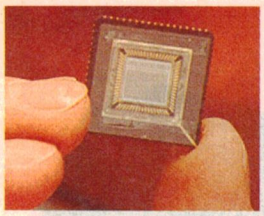


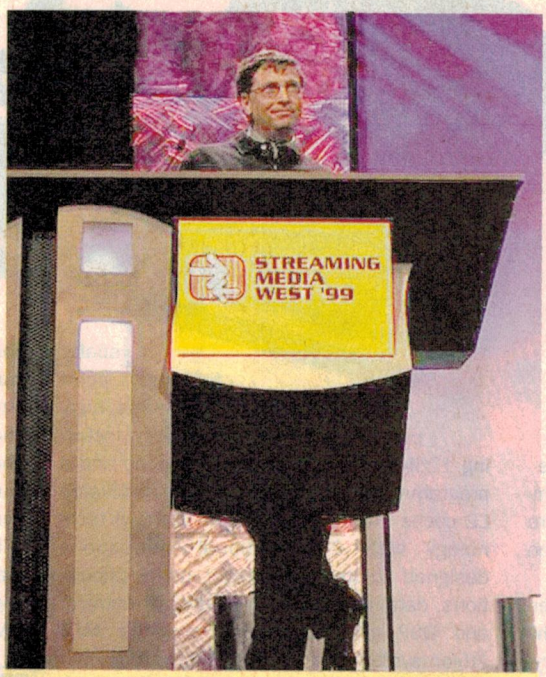
Silicon Valley Newsletter

Hitachi moving DRAM production from Japan

IN ONE OF THE most telling pieces of evidence showing how the economic tables have turned on Japan's semiconductor industry, Hitachi has announced that it expects to end domestic production of DRAM memory chips as early as 2001. The company has been shifting DRAM production to plants in Singapore, where it owns the Hitachi Nippon Steel Semiconductor Singapore subsidiary. The production transfer process will be completed within the next 24 months, Hitachi said.

The only remaining Hitachi DRAM factory in Japan is located in Ibaraki. It will make higher quality ICs such as system LSIs. DRAM production at the Singapore venture currently accounts for more than half of the Hitachi group's production.

In the 1970s and much of the 1980s, Japan's IC industry boomed and DRAM chips were produced almost exclusively at domestic plants that were the showpieces of the country's economic miracle. But for much of the past decade, Japan's IC industry has been in states of recession and production has been moving to plants elsewhere in Asia, Europe and the United States.



Speaking at the Streaming Media West '99 Conference & Exhibition held in San Jose in December, Microsoft Chairman and CEO Bill Gates said that streaming media will be the next major wave in computing and will bring entirely new benefits to consumers worldwide, as digital audio and video become as mainstream as text and graphics are in the Web today. (Business Wire photo)

Sun moves into server farm business

INTERNET-RELATED DEALS are getting bigger, as the global online economy shifts into higher and gears. In December, Sun Microsystems said it is partnering with Inktomi and Digital Island to install 5000 high-speed Internet servers at Internet Service Providers in 350 metropolitan areas around the world. The servers will let ISPs offer new high-speed online business services to the growing number of companies.

The servers will be equipped with Inktomi traffic and content delivery software that is designed to speed up the delivery of Internet data. Inktomi and Sun both made undisclosed equity investments in Digital Island as part of the deal.

"The goal is to push information and content to the edge of the network where it becomes faster to retrieve and send", said Sun president Ed Zander. "Sun has long pushed the concept of distributed computing under our mantra, 'The Network is the Computer'. The world is coming around to our view," Zander said.

The Sun-Inktomi-Digital Island deal is the latest in a series of moves by key players, including Intel and AT&T, to seed the global market with high-speed server farms and other such installations to service the e-commerce requirements of many corporations.

Top IBM executive moves to Dell Computer

JAMES VANDERSLICE, one of IBM's top executives and chief architect of IBM's booming computer data storage business, has resigned from his post after 30 years of service and is joining Dell Computer as vice chairman. Vanderslice has been IBM senior vice president and headed IBM's Technology Group. He will replace Dell Vice Chairman Mort Topfer, who plans to retire from Dell at the end of 2001.

IBM downplayed the loss of one of its top leaders, saying Vanderslice's departure came as part of a plan to reshuffle several senior executive positions. The company has quickly appointed Linda Sanford, the chief of IBM's sales force, to focus solely on the IBM storage business, which Vanderslice headed. Nick Donofrio, head of IBM's research division, was named to replace Vanderslice as head of the technology components unit.

Vanderslice was responsible for several of the US$30 billion worth of multi-billion component supply deals IBM signed in the last year with major computer makers, including a seven-year, $16 billion component supply pact with Dell. He rebuilt IBM's hard disk drive business by aggressively incorporating new technology, developed at IBM's San Jose-based Almaden Research Laboratory, into new storage products and by focusing on making selective components rather than commodity drives themselves.

Vanderslice will join Dell Chairman and Chief Executive Michael Dell and Kevin Rollins, another company vice chairman, in the company's three-man Office of the Chief Executive. Dell also announced this week that it had named Sam Nunn, the former US senator from Georgia and one-time head of the Senate Armed Services Committee, to join Dell's board of directors.

Applied investing $500M in diagnostics

CHIP EQUIPMENT industry leader Applied Materials announced plans to boost its position in the market for diagnostic tools by spending US$500 million over the next three years to develop advanced new metrology and yield management tools that help improve production yields as chips become smaller and more difficult to produce.

The diagnostics tools market is controlled by KLA-Tencor, which currently enjoys a 50% market share. Hitachi ranks a distant second and Applied is third with about 14% of the market. Applied said it hopes to achieve a 45% market share.

Applied entered the diagnostics market in 1996 with two ill-fated acquisitions of Opal and Orbot Instruments, both of Israel, for US$285 million. Initially, the two acquisitions have performed poorly for Applied,

which was forced to write down the value of the investments by $70 million

In 1999, under the new leadership of Gino Addiego, a former KLA-Tencor executive, Applied launched several key new diagnostics and its business is now growing. Applied's tools can now inspect circuits as small as 0.1 micron.

Diagnostics is increasingly important to chipmakers as they shrink the size of circuits. Advanced new diagnostics tools, for example, can detect small variances in the processing of certain films and can flag wafers that will require additional processing on a particular film to ensure that the bulk of chips on the wafer make it through the production process.

New set-top box chips are smaller

AS THE MARKETS for TV set-top boxes and cable modems that provide high-speed access to the Internet take off, demand for chips powering those devices is growing rapidly as well. Recently two major competitors in these up-and-coming markets, Broadcom and Conexant Systems, introduced new fingernail-size 'tuner' chips to replace existing ICs that average about 50mm in length.

Some 13.3 million set-top boxes valued at US$2.3 billion are expected to have been sold during 1999, increasing to 14.6 million units in 2000 — worth US$2.45 billion. The cable modem market also is growing: about 2.6 million modems will have been sold in 1999, increasing to 3.6 million in 2000, creating a market worth US$1.1 billion.

Both Broadcom and Conexant make tuner ICs that fit inside set-top boxes and control functions such as channel changing and multiple pictures on the TV screen. Because the new chips are smaller than existing tuners, set-top systems can be made smaller and offer more features, such as telephone service over the same cable that brings television and Internet service into the home.

GPS dome antenna from Motorola

NOT ONE OF THE more glamorous of technologies in the digital wireless voice and data revolution, the antennas that receive and transmit signals are nevertheless undergoing somewhat of a revolutionary change of their own. Motorola has launched a new high-performance, dome-shaped antenna for wireless voice and data applications.

The new Oncore Timing2000 Active Global Positioning System (GPS) antenna offers performance improvements over more traditional flat antennas. Flat antennas can be affected by extreme weather conditions, such as snow or ice build-up that can block signals. The new dome shaped antenna protects against such weather-related problems.

The Oncore antenna draws just 26 milliamps at five volts. Production antennas were expected in early January 2000.

Storage startup hits the jackpot

THE UNUSUAL MOVE by start-up C3D to stage a public demonstration of its revolutionary optical data storage technology in the heart of Silicon Valley is paying off huge dividends for the company and its shareholders. C3D's shares rose by more than $20 in the week following the demonstration, hitting US$54. Last April they were only $1.50.

C3D claims its new multi-layer disc storage technology allows a single Read-Only disk to store up to 140 gigabytes of material, enough for 30 two-hour movies. The C3D disks contain up to 20 layers in which data can be stored. DVDs, by comparison use a two-layer system that can hold 4.7GB.

C3D decided to make the public announcement in Silicon Valley to attract the attention of some of the area's disk drive industry leaders such as Seagate, Maxtor, IBM and Quantum. Other companies that may be interested include Hewlett-Packard, Sony and Hitachi. Representatives from Dell and Apple Computer also attended the demonstration.

Ziff-Davis sells publishing group

ZIFF-DAVIS, the world's biggest publisher of computer and other high-tech trade journals since the early days of the IBM PC, announced it is selling its publishing division to the investment firm of Willis Stein & Partners LP for US$780 million. The move is designed to eliminate ZD's US$1.2 billion corporate debt, which has prevented the company from showing a profit since April 1998. After the sale, Ziff-Davis' remaining businesses will centre around the Comdex trade shows, the publicly traded online ZDNet unit and the Internet-based learning service SmartPlanet.com.

The ZD publishing group counts some 80 titles and has annual sales of US$500 million. It reportedly earns about US$100 million per year. The group includes *PC* magazine and *PC Week*.

Investors were disappointed that the publishing group didn't fetch a price in excess of US$1 billion. Previously ZD sold its market-intelligence business for $106 million, the ZD Education unit for $172 million and the cable-television channel ZDTV for $204.8 million. The latter unit was bought by Microsoft co-founder Paul Allen.

Willis Stein is based in Chicago. The company has appointed James Dunning to be chairman of Ziff-Davis Publishing. Dunning had been chairman and chief executive of consumer magazine publisher Emap. ❖

Windows 2000 is ready

Windows 2000 is finished. Microsoft has announced that work on the massive network operating system (NOS) is completed and the software is moving into the manufacturing phase. Windows 2000 was shipped on December 15 to manufacturers and computer makers and will be available to corporate customers on February 17.

The announcement sent Microsoft shares to a new record US$108 per share, giving Microsoft a market value to $554 billion, more than Spain's gross domestic product. Bill Gates' own 878 million Microsoft shares soared $7.7 billion in one day, to $85 billion. That is worth more than Ford Motor Company or the economy of the Czech Republic. Based on the size of their economy, Gates could afford to buy Hungary, Iceland and Luxembourg. A single Microsoft share bought for US$20 in 1986 when the company went public is worth $15,000 today.

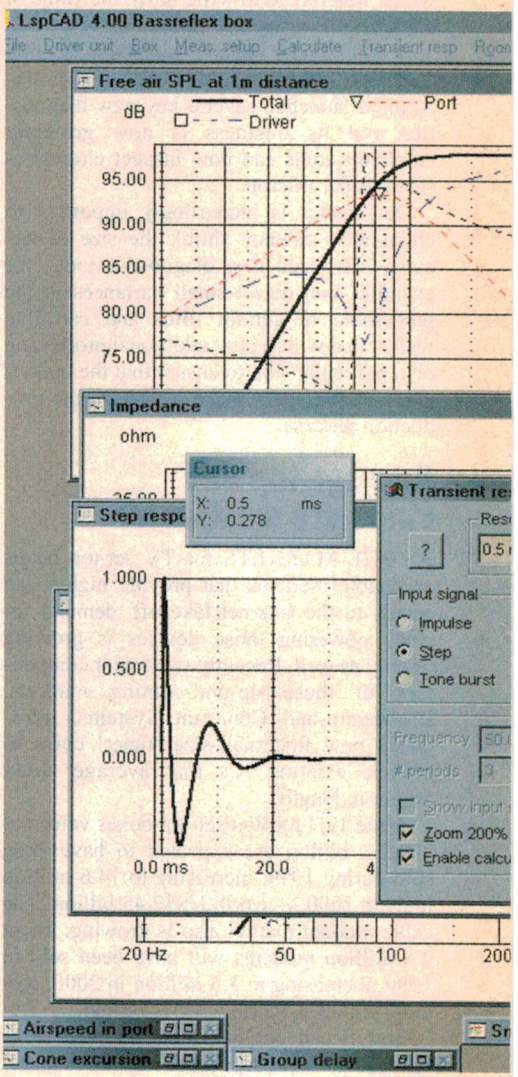
Windows 2000 has taken more than three years of intense development, as Microsoft aims to increase its share of the network server market. That goal has become considerably more difficult in the past year than it seemed three years ago, when Microsoft had little or no competition in the market for Intel-based server and network OS platforms. But the growing popularity of Linux and other Unix NOS is giving Microsoft a run for its money in the networking market.

Windows 2000 took more than US$1 billion to develop. It has more than 30 million new lines of computer code. Originally the program was supposed to cover everything from servers to desktop computers, but the latter project proved too ambitious and was scrapped earlier last year. For the foreseeable future, a separate Windows 98, and its 'Windows Millennium' successor (planned for release in the Fall of 2000) will remain the OS for the PC desktop.

"It took us a while to get here, but it was because we weren't willing to compromise", said Brian Valentine, senior VP of the company's Windows division.

Besides the reaction the Windows 2000 completion, Microsoft's stock is also benefiting from persistent rumours that the company has agreed to the basic terms of a settlement with the US Justice Department in the antitrust lawsuit.

Speaker design with LspCAD 4



Featuring both enclosure and crossover modelling, LspCAD (LoudSPeaker Computer Aided Design) is a software aid to constructing and simulating all aspects of loudspeaker boxes. Version 4 of the package is now available on the Australian market at a quite competitive price, and if you're into speaker design, it's well worth a look.

by Graham Dinning

Back in the old days you would sit there with your old Casio calculator (or an HP if you wanted to save on keystrokes) and copious amount of paper, while drooling at the 'massive' computer power available to the big boys of loudspeaker design, who were sitting at the console of a machine with bytes of memory and kilobytes of storage capacity. They could use machines to punch cards and print paper a lot faster than you could ever hope.

Over the years though, the computer industry has worked out how to put mega in front of bytes and giga in front of storage, while simultaneously replacing mega with kilo in front of the dollars charged for a computer.

My point here is that the computer hardware available to the average person these days is so far advanced that it seems like almost unlimited computing power is now available to a speaker enthusiast, and at a price that seems ludicrous to us old timers (older than 30 that is).

One of the more useful tools for a speaker designer - apart from the actual measurement tools such as MLLSA, CLIO, IMP or LAUD - is software that allows you to do a series of 'what if' scenarios quickly and accurately, before you commit to spending your hard earned budget on the actual speaker components. A bad driver choice in a multi channel hi-end theatre system can end up costing you much more than the best PC hardware that's currently available.

These design tools have varied from basic beginner-oriented software to no holds barred packages such as MATLAB, and the various flavours of SPICE (sorry!). However, the programmers of high-end packages seem to assume that all loudspeaker designers have computer science degrees. You tend to get packages that either take advantage of modern graphical user interfaces (GUI's) and are slightly dinky for experienced users, or wonders of command line design that you spend more time navigating through than actually doing what you want. Let's face it, you want to use the tool for fast results not for learning computer science.

Every now and then though, a package appears that does a great job of removing the tedium and getting you just a bit closer to the 'think it through the computer' paradigm. I was lucky enough to get my hands on such a package thanks to the Sydney-based audio design service, Occasion Audio. They asked if I would be interested in evaluating a loudspeaker simulation package called LspCAD which Occasion was about to offer into the Australian market, and while I was initially dubious, their enthusiasm for the product soon won me over.

Trying it out

Shortly after that, two 1.44Mb disks plus an 85-page A5 handbook arrived in my incoming mail from Occasion Audio. The installation process was as easy as running the setup file on the floppy, and a few minutes later I had a 1.8M application ready to run. With a software package of that size, I thought it wouldn't take me long to run out of things to play with.

Boy, did that turn out to be wrong!

In my initial discussions with Occasion Audio I was told that the man behind the package, Ingemar Johansson, had been heavily involved in setting up the standards for digital voice transfer in mobile phone sys-

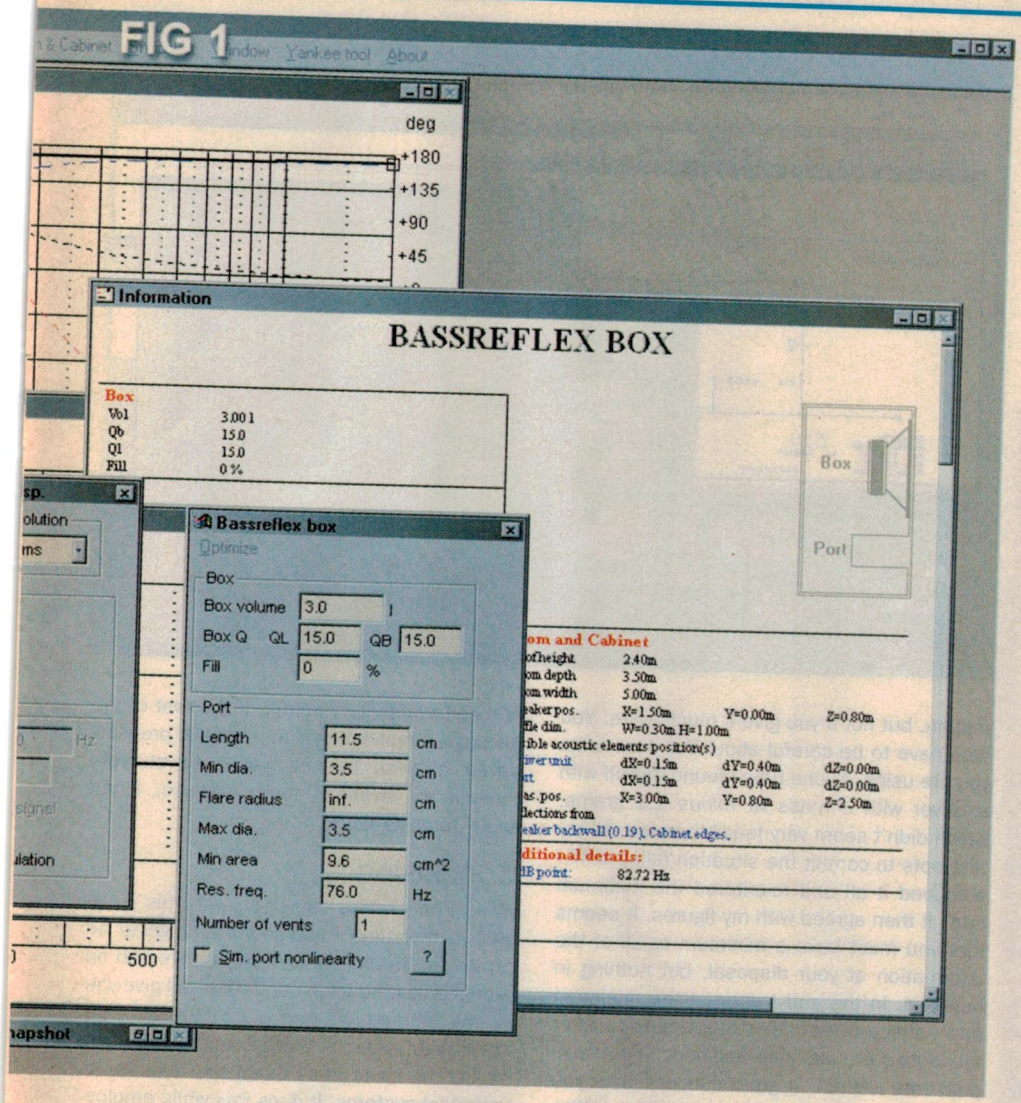


Fig.1(left): LspCAD's driver/box analysis section in full flight. While a bass reflex (ported) enclosure is under scrutiny here, the package can deal with nine diffrerent types of box design.

tems. That's all very well, but I was looking at *hi-end* audio design rather that *low-fi* mobile sound - I was getting one of those feelings again. Neverthless, I drew a large breath and started up LspCAD.

I was initially presented with a full size blank screen with two menu options: File and About. I chose file, went to a sub menu, chose Box, went to the next menu and chose ported. No driver specs on hand? No problem. The program told me to go and grab a driver from a variety of drivers in the preloaded database.

I chose a Focal driver that I knew a bit about, selected it via the standard Windows interface, hit OK, and was presented with a thoroughly modern object-based program that takes every advantage of a graphical interface that I could consider possible, with this size package. I had nine sub-windows within a main window that allowed me to have all open at once, and a main screen area which auto-resized to accommodate them all.

The nine screens give you all the reponse and data information you're ever likely to need on the current design, and most are kept as minimised bars at the base of the screen. However, two of these are presented by default: the Impedance and free air SPL graphs. These two on their own give you enough information to see whether you are close or way off the mark in you current design.

The other screens are more esoteric, but very useful. Once you have a reasonable looking response graph and impedance shape, you can start toying around with the other aspects of the program to fine tune the system. The depth of LspCAD's analysis is also impressive.

Let's face it, you want to use the tool for fast results not for learning computer science

This package fits the description of deep design down to a tee. It allows you to get going quickly with the minimum of holdups, presents appropriate information to you initially, and has enough depth in design that even the most hardened designer will find useful. Within a day I redesigned one of my previous designs from the ground up, and the results from this package very closely matched the real world results.

With LspCAD you are able to import and export measurements to and from industry-standard packages such as LAUD, LEAP, CLIO and MLLSA. This is where the fun starts. Once you have a basic driver/enclosure that you consider perfect for the job, you can then build the system, measure the system, go and select either active or passive crossover systems, bring in your measurements, set up your calculated crossover values, and see the results. Then if that doesn't work as expected, you can get LspCAD to calculate values to match your target response in either active or passive crossovers. This is beginning to be fun!

While I found this package to be a bit limited compared to SPICE-based systems as far as freedom of design is concerned, it does what it does extremely well.

As a final note about depth of design, one of the graph's displayed gives you 'In room' responses. Now this has been one of my major gripes over the years when having to deal with people who have bought a 'two-dollar' room response package. The ability to accurately portray what will happen in a real room is *very* complex, and therefore expensive by nature - a inexpensive package just isn't capable.

However, LspCAD actually acknowledges a few things here. The first is that not all boundaries are created equal, and secondly that there are disagreements as to the loading effect a boundary will have on the final response. I think in this case Mr Johansson has taken a sensible step in the right direction, as he allows you to enter K factors (the ratio of reflected energy) for each boundary in the space. There are suggested values as a default, and along with this is the ability to enter a figure for your personal view on what total effect a boundary will have. In my opinion, this is probably the best compromise - considering the complexity of this subject. It allows you to get a better feel for the response, while allowing you to enter your own *tested* information if you know it.

The help system on LspCAD uses Windows' Notepad. While initially I would have preferred an HTML based system (that's just my preference), the use of Notepad lets you easily add your own comments and additions with limited resources being tied up. The more I think about it the better the idea seems. You can add any additional information you consider important to the help system with very little effort.

FIG 2

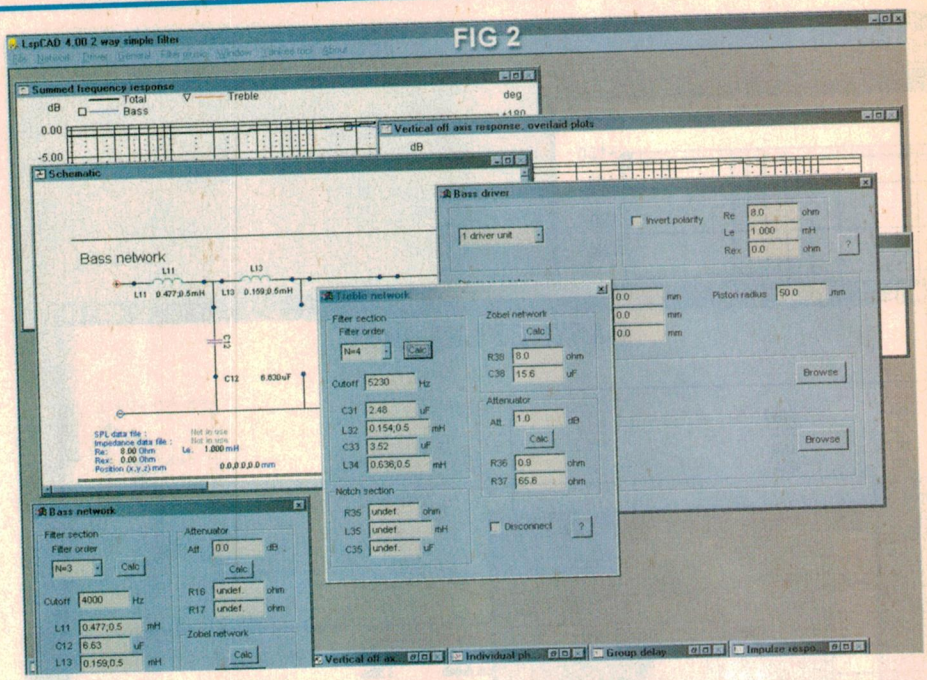


Fig. 2 (right): The software includes a quite powerful crossover modelling section, which is unusual for a speaker analysis program in this price range.

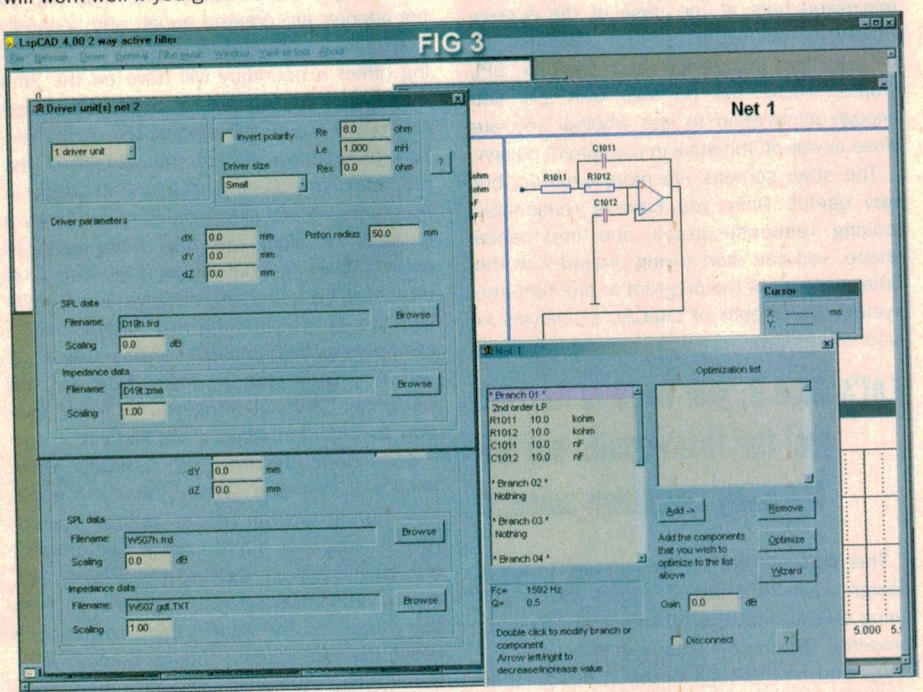
Gripe time

Before I get accused of being a puppet here let me just pop in a few gripes. As with any package as complex as this one, there are bound to be issues that I personally don't like. The fact that LspCAD is as well designed and integrated as it is makes a few things stand out though. As you get deeper into the package you enter that realm of trying to do things that aren't at all self-explanatory in this package. One of the issues was with dual voice coil drivers. When entering data on a driver, it wasn't immediately clear to me whether I was entering data for one coil driven, two coils driven in parallel, or two coils driven in series. While it may not matter in some systems, *this* system has the ability to flip into twin-coil operation, so here I would have to assume something - and hate that!

Secondly, some of the more complicated operations are a bit cumbersome compared to the rest of package. It is sort of like finding a cheap radio in a BMW. You probably wouldn't notice if it was in a lesser product, but to be fair, it's only the excellence in most of the package that makes this sort of thing stand out.

Thirdly, when entering information for a driver you can ask LspCAD to auto-calculate parameters, if it is possible. The auto-calculate feature is a bit on the clunky side and will work well if you give it the minimum information, but not if you give it much more. You also have to be careful about the drive units you are using. At one time I found myself with a driver with a mass of *minus* 1.1 grams, which didn't seem very feasible to me. All my attempts to correct the situation failed until I scrubbed it all and re-entered the minimum info - it then agreed with my figures. It seems that you must have a minimum or all of the information at your disposal, but nothing in between. In the end I entered the minimum and corrected the slight discrepancies after the auto-calculate was finished. The above problems are not of great concern once you know the routine, but they lack the intuitive and self-explanatory nature of the rest of the package. Considering that you have probably saved a week by not having to stumble through an 'average' user interface, I can easily forgive this.

FIG 3



The crossover analysis module also deals with active filters - very useful indeed...

Conclusion

While I only had a day or so with this package, in that time I had found enough to be convinced that Mr Johansson has created an exceptional product in LspCAD. It will give you all the information that a serious designer will probably need in 95% of cases. The other 5% can be covered by those that can afford specialist systems. It does this while employing an up to date design, making it as easy as possible to get around. In my time with this package I found it to be exceptionally stable. The system I installed it on was a borrowed bare-bones 433MHz Celeron office machine running a 17 Inch screen. Except for the screen it's as basic and about as cheap as you can get in a new machine, while LspCAD is efficient enough to utilise even low-spec older computers.

As with any review it helps to compare apples with apples, so to be fair I had to know the price. The price, as it turned out, gave it a *must have* rating in my opinion. At $299.00 Australian you can buy LspCAD in a boxed set with manual, while the moderately-restricted Lite version (LspCAD Lite) is priced at $80 - both prices do not include post and packing costs. If you can afford this kind of money, and you are at all interested and reasonably proficient in loudspeaker design then grab it now before the distributors wake up to themselves.

For more details on the LspCAD range - including the free demo version - contact Occasion Audio at **sales@occasionaudio.com.au**, phone (02) 4571 1016 or fax (02) 4571 1591.❖

(Continued from page 45)

that is used to notify the driver when an intersection is approaching or which route is recommended. The voice function and map characteristics can be altered subject to personal preference.

Another useful function is real-time route determination. Traffic information can be gathered from the radio system and used to update possible routes, assuming that the destination has been pre-programmed into the system. This is available only if there is an infrastructure that supports the transmission of digital traffic information, which is very common in Europe.

Fig.3 shows a block diagram of a typical GPS receiver system. An M7CORETM family MMC2003 microcontroller is used in conjunction with an RF Dual Down Converter chip (PSRF1111A). It is a relatively simple configuration, but has been optimized to ensure that the power consumption of the unit is very low.

This is a requirement if the GPS receiver is to be 'woken-up' by an anti-theft unit. When the receiver has been woken up, the navigation system can transmit a signal that allows the vehicle to be located by the appropriate authority. The operating voltage of the circuit is 3.0v and the processor will run at a speed of around 33MHz.

Both chips have a clock input circuit which is controlled by a Phase-Locked Loop / Voltage Controlled Oscillator configuration. This clock circuit is an important part of the low-power consumption mechanism. When the system can take advantage of periods in which it does not have to process information at full speed, the clock circuit can ramp down the operating frequency, thus saving a considerable amount of battery current.

One such system on an automobile would not, in itself, amount to a huge load on a 12v battery. But consider that the average automobile usually has in excess of thirty electronically controlled systems, so power saving becomes an important issue.

The control algorithm for the system uses 256KB of memory space, implemented in a masked ROM array. As the systems become more complex in the future, this memory size is expected to increase.

The algorithm's complexity is basically down to the fact that the receiver computes its location by locking onto at least four GPS satellite signals as well as the inertial sensors (which include a yaw rate gyro sensor, electronic compass and speed signal from the dashboard or braking system). The algorithm must also be smart enough to ensure that it can continue to track the position of the vehicle in the event that the GPS signal is lost.

It can be seen from Fig.3 that the technology which is used to implement this system is not remarkably complex. The overall benefits from the advanced functions which GPS-based navigation systems offers is really a result of the sharing of data between several different discrete systems, networked to provide the total system. The airbag system plays an important part, as does the cellular communications systems, as do the inertial sensors (which will also be the main source of input data for the electronically controlled anti-lock braking system).

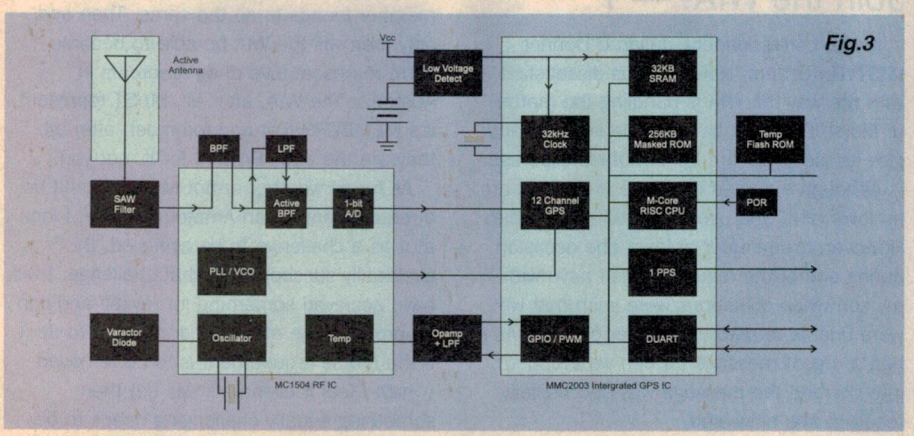


Fig.3

Advanced applications

Although consumer automotive systems are set to become the next growth area for navigation systems, GPS-based navigation technology is used in many other interesting systems such as hazardous waste tracking, weather balloon tracking and ice flow monitoring.

Recently certain golf courses have had GPS navigation systems implemented on golf carts in order to track the positions of each set of players. The motivation in this case is to optimize the tee-off timing of the golfers. Another slightly more bizarre concept which has been considered is to introduce motorized golf bag buggies which follow a golfer around as a traditional caddie would!

Conclusion

One the biggest challenges of driver information systems has always been how to optimize the amount of information which is provided to the driver whilst ensuring that presentation of this information is not distracting in itself. The merging of advanced technologies such as speech recognition and text-to-speech synthesis systems has proved to be important complementing technology for traditional map-only based navigation systems.

In addition, the availability of cost-effective sensory systems which can be shared with existing automotive systems (the inertial sensors) has also helped to reduce the overall cost of implementing an effective and reliable GPS-based navigation system.

Several sources indicate that the growth rate of such systems is expected to be significant. This includes both factory fitted and after-market versions. If the availability and widespread implementation of such systems improve general road safety, traffic congestion problems and lower the probability of vehicle thefts, there will be an overall cost benefit which is difficult to measure but will nevertheless be significant.❖

Letters to the Editor

Australian industry dead?

May I add to your worries about the future of the electronics industry in Australia?

In October I attended the Hong Kong Electronics Fair. Well over 1300 exhibitors from all over the world were displaying their wares. There was one exhibitor from Aus.. I visited that stand to say hello. There was one person on duty, and he had on display some label printers and wrist watch computers. I said hello and asked "Are these made in Australia?". "No" he replied "Not much is!". That was the end of our conversation.

"Not much is!" I was a bit put out. I thought we were good at something. such as telecommunications gear, so why weren't we there? The H.K. people are mad about communications, and mobile phones are as common as wrist watches. They don't get them for nearly nothing as we do here, and yet they're in use everywhere — in the streets, on the buses, even very deep underground in the Mass Transit Railway system.

All a bit depressing I thought.

A. J. Lowe, Bardon QLD

Net worries

The Internet today has changed from being a resource tool to an advertisement platform. Institutes are no longer giving quick information services but have joined the ranks of those competing for the best looking home page with lots of flash and ads. This however is killing the the Internet as a resource tool, as phone costs and Internet supplier costs increase in most countries through the time taken to open these graphic heavy pages.

Australian's may not appreciate this fact as they are very lucky to have Telstra who do not charge by the minute for local calls and supply good service on their lines. As an Australian living in Japan I now realise how good their services are and sort of apologise for all the abuse I have dished out to them in the past. I could download data nearly twice as fast in Australia with my Pentium II as I have been able to in Japan using local suppliers with the same computer.

Using the Internet from home to do Web searches is useless as it can take over six minutes to open some of these graphic heavy sights. I am lucky to have access to a system that can download at very high speeds but even this system is affected by the connecting line speed or the supplier who hosts the site and at times I find no difference in the time it takes to open a home page using the faster system which can download 8+ MB in seconds.

This traffic jam of data however is turning many people away from the Internet. I use the Internet very little now as I do not have time to waste waiting for sites to open that only contain adverts and very little else. Many friends once Internet addicts no longer search the Web and now only use E-mail because the Web is so time wasting.

Internet usage in Japan is very low because of the cost but the Japanese are starting to realise how useful it can be. Luckily most new users are quickly disillusioned by how much time and money they waste looking at adverts. Luckily because if another 50 million people start using the Web the data will flow even slower.

The only answer is a data limit on home pages; home pages should introduce the site like an abstract so valuable time is not wasted, not provide a data hungry advertisement board. The short abstracts and percentage ratings are not a lot of help on true content.

I never wait more than 60 seconds for a site to open when searching now as bigger home pages are mostly full of adverts. I even ignore the suppliers site by having 'blank' in my browsers address line. I would forecast the decline of consumer Internet usage within the next two years, possibly a quick death like CB Radio with many companies going broke if the present usage of home pages as large adverts continues.

Electronics Australia takes 120 seconds from Japan before all items are downloaded using a Pentium II from home, just opening your page I was charged 4 minutes telephone costs and 3.5 minutes from my ISP.

Yumiko Horiguchi (via email)

Join the WIA! — 1

If your correspondent, Julian O'Donnel VK3TYB, (Letters, Nov.1999) is dissatisfied with the way the WIA is handling the matter of Morse Code, let him join the Institute and give its members the benefit of his expertise.

Although I learned the Code in 1930, I am no lover of it, and use it as little as possible. However, I remember at least one occasion during one of the regular skeds I have with my son when conditions were such that we were unable to read each other on SSB. As I had a urgent message for him we dropped into CW and the message was successfully received and answered.

The Code can be useful in case of emergency and I agree that its use should be retained, although not necessarily at the current speed of 10wpm

Franklyn Pain VK2DYP, Belrose, NSW

Join the WIA! — 2

I would like to take Julian O'Donnel, VK3TYB to task for his letter in the November column.

I am proud to be a member of the Wireless Institute of Australia (NSW Division) which I have been since I became an Amateur almost 29 years ago. I started out with a Limited call, as Julian has, and migrated to a Combined (now Intermediate) call some eleven years later. I am currently attempting to pass the ten words per minute Morse to get the Full licence.

In his letter Julian states "...does not represent the views of myself or the majority of Australian radio amateurs." and further down "Not responding to correspondence from non-members, including myself...". Herein lies the crux of the problem. Here is another person, who can't be bothered to join the WIA, criticising it because it doesn't do what he thinks it should do. Well sorry Julian but you don't have that right!

Sure, the WIA only represents around a third of the Amateurs in Australia but whose fault is that? Certainly not the WIA's. It is the fault of those who are not members. Those of us who are members are already doing our bit. If you are not interested enough in your hobby to become a member, you deserve whatever happens. It is the same if you are a member of a union in your industry and costs a lot less. The union is there to represent the interests of it's members to governments and employers, not those of non-members.

If you are so intent on having something done about the Morse code requirement, why don't you join the WIA and get all your non-member friends to do the same. Then and only then will the WIA be able to become more representative of all Amateurs in Australia. The WIA, after all, MUST represent it's MEMBERS first and foremost, after all, they are the ones PAYING for it, not you.

As far as whether or not Morse should be a requirement for an Amateur licence, I look at it as a challenge to be achieved. By eventually succeeding in that challenge, I will have achieved something for myself and can be proud of the effort I had to put in to do it. If the Morse requirement is to be removed (which I feel it eventually will be) then something equally challenging needs to be

found to replace it.

I, like many others, do not believe that the full privileges should just be handed out to everyone on a silver platter, rather, they should be earned. Remember, also, that as a signatory to the ITU (International Telecommunications Union), Australia must observe the current ITU regulations which still require Amateurs to show Morse proficiency to use the HF bands. This is a matter of principle.

There are five levels of Amateur licence from an entry level which requires only minimal theory and no Morse up to the full licence. I believe that we have a reasonably good system which doesn't need to have it's standards reduced further. Let's concentrate on other aspects such as retaining the bands we have or lowering licence fees.

Eric van de Weyer VK2KUR MWIA (via email)

S.A.E Manuals needed

I have just been browsing through some of my old copies of EA, when it occurred to me that you, your staff, an advertiser or maybe one of your many readers may be able to help me. I own an old S.A.E. (Scientific Audio Electronics) MK 31B Stereo Power Amplifier. Serial # 31-01728 which is in need of repair. 'So take it to a qualified man.' I hear your cry, if only it were that simple! Several technicians have inspected the amplifier, agreeing that it is well worth repairing, but cannot help me due to the fact that a large number of the components only carry an S.A.E. part Number and/or code which means nothing, unless you have original replacement components (unobtainable?) or the appropriate cross reference material.

I have approached several suppliers, however nobody seems to have even heard of S.A.E., let alone have S.A.E. components or reference material.

So, I write this letter in the hope that someone has information regarding component values, availability (particularly the output transistors), and as requested by the technicians, a circuit diagram. Any help would be greatly appreciated.

Alex Bond, 117 Yarrowee St.
Sebastapol VIC. 3356

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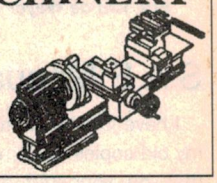

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Forum

(Continued from page 48)

How does this work? The 'official' DVD signatories seem to be losing out to the non-signatories. The system doesn't seem to be working very well.

Thanks for the articles. I hope to hear your comments.

Thank you for your message too, Mr Coop. I agree with you completely about HD being largely unnecessary, but I have a feeling we're going to be lumbered with it anyway. My view is that we should certainly leave the door open for broadcasters to provide HD if they wish, especially in the future, but not force it upon everyone right from the start — especially if this denies consumers the right to choose low cost set-top boxes, SD signals and many more programmes.

On the subject of 'all regions' DVD players like the one you were able to buy, I really don't know how these can legally be sold here. Presumably you're right, and the manufacturer concerned wasn't a signatory to the DVD licensing agreement. But as you say, in one sense that gives them an unfair advantage over the manufacturers that *did* sign, doesn't it? And buyers like yourself an unfair advantage over those who bought a bog-standard region 4 player, too...

It really is a murky situation, in more ways than one. Luckily the release of region 4 software has really speeded up, so that region coding isn't disadvantaging local consumers *quite* as much as it was.

Moving on again, you may recall the item in December's column by Melbourne reader Kevin Attwood, complaining about the way movies are speeded up by about 4% on PAL-format DVDs. Here's one response I've received by e-mail already, from reader David Leaver in Hawker, ACT:

I refer to Mr Attwood's letter quoted in the December Forum. I do not wish take issue with his facts. It is his reaction that puzzles me.

Virtually everything he has ever seen from broadcast television signals, from video tape, from laserdisc in PAL mode as well as from DVD, whose ultimate source was movie film, will have been shown 4% too fast, for all such material is simply converted frame by frame. It is extremely difficult and costly to do otherwise and the acceptance of the discrepancy by all of us shows that it is not necessary.

The resulting 4% increase in pitch is somewhat less than a semitone, a semitone being a bit over 5%. This may be important if you are Pavarotti going for a high C, but for most mortals it matters not a jot.

One might just as easily complain about what the conversion to NTSC does to the picture. In that, every second movie frame is converted to three TV frames rather than two. This gives the 5:4 = 30:24 ratio required for the correct speed.

Thanks for your comment too, Mr Leaver, and for pointing out that the same applies to movies broadcast on PAL TV, recorded in PAL on videotape, and so on. I should have done that myself, I guess.

I suppose you're also right in claiming that most people are incapable of noticing the speedup, although some people like Mr Attwood obviously can, and find it irksome. Perhaps most of us should be grateful we don't have 'perfect pitch', after all!

While we're on the same subject, here's another comment that came as a fax from Ken Simpson-Bull, of Glen Waverley in Victoria:

Like Mr Attwood, I have long been aware of the increase in pitch of the sound in movies run on PAL television. It is particularly jarring if one is familiar with the natural voice of an actor or singer from CDs or LPs. In addition, familiarity with a musical score from a movie makes the musicians in a PAL replay sound like they're in a hurry to catch a bus! Removing regular odd milliseconds to avoid pitch change is a way of overcoming part of the problem, but no one does it.

This is one of the reasons that I also purchase NTSC laser discs and DVDs. Movies (shot at 24 frames per second) can be transferred to PAL at the correct speed. However unlike NTSC with its relatively simple field conversion, with PAL the pixels from a scanned film frame are redistributed to the next field, and so on. This results in some smearing of the image, particularly visible when there is motion, with the net effect of reduced resolution. Sadly, with our PAL system we have to choose between two evils: reduced picture quality or speeded-up sound.

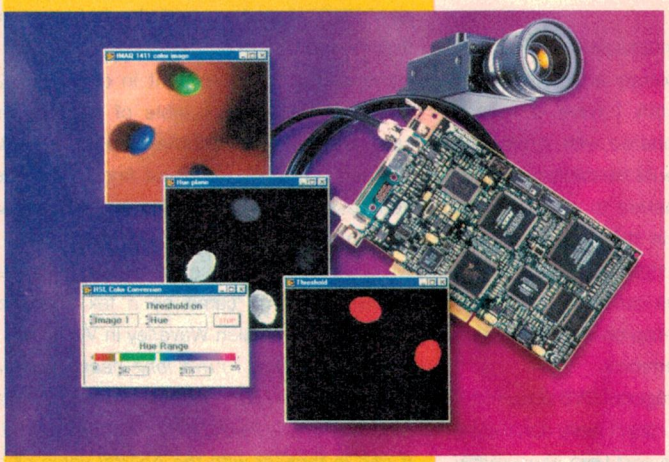
Thanks for your comments too, Ken. It looks as if you're like Mr Attwood, and *can* detect the speedup. I wonder how many others can, though? I know I can't.

By the way, I don't quite understand how *removing* millisecond-level segments can overcome the speedup problem, either. I'd have thought removing anything would make it worse, not better. Perhaps the best way would be to use a very high quality digital rate converter — like a very big, very fast two-port RAM, or perhaps two of them (one for the pictures, the other for the sound bitstream).

That's assuming the problem is deemed serious enough, and by enough people, to justify having to do anything about it. ❖

COMPUTER NEWS & New Products

Colour image acquisition board



National Instruments has announced a new colour image acquisition board that maintains high-performance, high-quality captures despite lighting variations. The IMAQ PCI-1411 offers machine vision developers real-time colour conversion of NTSC, PAL, and S-Video formats to the hue, saturation, and luminance (HSL) image planes. Because the hue plane is effective for analysing images where shadows and lighting gradients are present, the IMAQ PCI-1411 makes inspection systems more reliable.

With the new board, industrial inspection and scientific imaging developers can increase the reliability and performance of numerous applications, including inspecting light emitting diodes (LEDs), fabric and textiles, colour paint and powder, pharmaceutical blister packs, and in typical monochrome applications where lighting is difficult.

With real-time colour conversion to HSL image planes and partial image acquisition with a programmable region of interest, the IMAQ PCI-1411 improves overall image acquisition and image processing speed. It excels when lighting is inconsistent or when shadows, reflections, and lighting gradients could occur within the image scene.

National Instruments ships the IMAQ PCI-1411 with easy-to-use NI-IMAQ driver level software, which offers a comprehensive software interface for image acquisition. With the software, vision system developers can quickly and easily start applications without having to program at the register level.

For more information contact National Instruments Australia, PO Box 466, Ringwood 3134.

192MB linear flash card

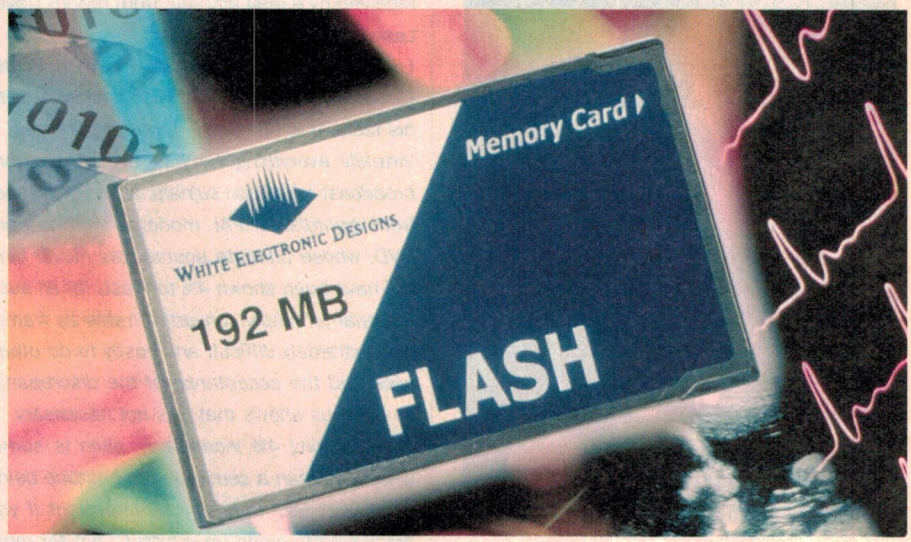
White Electronics Designs Corporation has introduced a 192MB linear flash PCMCIA memory card, and claims it has the highest density of any flash memory card in the industry today, and more than double the memory capacity of existing PCMCIA cards.

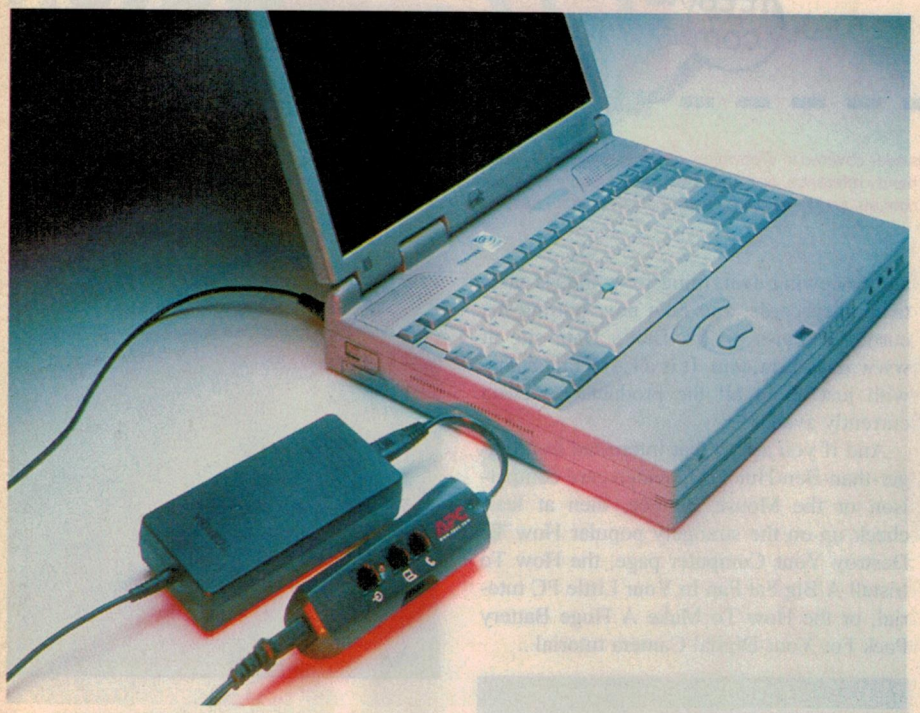
The new product combines Intel's Multi Level Cell (MLC) flash memory technology (known as 3V Strata Flash) and White Electronic Designs' Register Based Addressing technology, which was adopted as a standard by the PCMCIA committee.

The 192MB card is capable of operating in a wide, universal voltage range from 3V to 5V allowing a full plug-and-play functionality and memory upgrade solution for all mobile, battery powered applications. It is the latest in White's FLF10 Series, which now provides densities from 32MB to 192MB in 32MB increments. The series cards conform to the PCMCIA Standard, providing electrical and physical compatibility. The PC Card form factor offers an industry standard pinout and mechanical outline, allowing density upgrades without system design changes.

The FLF10 Series addresses the constant demand for higher capacity cards, providing high reliability non-volatile random access memory for code (telecommunications) and critical data storage (medical instrumentation) systems, where data integrity and density are the primary parameters.

For more information, contact White Electronics Design Corp., One Research Drive, Westborough, MA 01581.





Protects notebooks from surges

With international business travellers in mind, American Power Conversion (APC) has introduced a mobile notebook computer surge protector that is compatible with all voltage environments worldwide. With its compact design, the SurgeArrest Notebook Pro Surge Protector (Professional Series) offers professional convenient protection against damaging AC and telephone line surges and spikes anywhere in the world.

"Mobile computing plays a significant role in the overall PC market, with International Data Corporation predicting that more than 100 million portable computers will be shipped over the next five years", said Leanne Cunnold, general manager for APC in Australia and New Zealand. "As the number of business travellers and those working from home increase, the need for reliable mobile computing grows."

The APC SurgeArrest Notebook Pro Surge Protector, which has an operating voltage range of 100-240 volts, offers both AC and telephone line surge protection. In addition the portable device combines surge protection and an Excess Current Detection feature, which identifies potentially dangerous current conditions on a telephone line that may damage notebook modems. This feature is essential for business travellers whose productivity is dependent on the ability to connect to a network from the road.

APC's SurgeArrest Notebook Pro Surge Protector is available in Australia for an RRP of $57.99. For more information call APC's Sydney office on (02) 9955 9366.

Whiteboards have PC connectivity

Panasonic Australia has released three new electronic 'Panaboard' whiteboards — the KX-BP535 two-screen, the KX-BP635 widescreen and the KX-BP735 four-screen. All three can print on plain paper, and offer PC connectivity.

Russell Fisher, Product Manager, Whiteboards and Copiers, Panasonic System Products Division, said: "Our latest whiteboards can be totally controlled from your PC, and their built-in printer can be used to output documents stored on your computer."

"The whiteboards eliminate audience note-taking and increase attention and participation. They can print whatever is written, drawn or even taped to the screen, so they are great for providing copies of large plans, charts or maps."

An optional interface kit allows a Panaboard to be controlled from a PC. Information on the screen can be scanned and transferred to a PC, the whiteboard panels can be advanced, the printer can be operated and contrast levels can be changed. Documents already stored on a PC can also be output via the Panaboard printer.

To use any of the Panaboards, the presenter simply writes or draws on the large screen. Pressing a button will scan the entire page and immediately print out a copy from the printer onto A4 paper. Up to nine multiples can be made at a time, with an 80-sheet capacity.

The whiteboards can be used with a mobile stand for portability, or can be wall-mounted. The KX-BP535 and KX-BP635 have two screens each available to write on and have a writing area of 900 x 1400mm (HxW) and 900 x 1762mm respectively. The KX-BP735 has four screens and has a writing area of 900 x 1400mm.

The new whiteboards are available from Panasonic authorised dealers. For more information call (02) 9986 7348. ❖

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- 10 mW Laser Power Meter
- 3 mW Laser Power Meter
- DVD/CD/MD JITTER Meters
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- CD/CD-ROM/MD RF LEVEL Meter
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Webwatch

BY GRAHAM CATTLEY

Due to popular request, I've collated a list of all the sites ever covered in Webwatch, and it is available for download from our web site in the Internet files section. You can save the file on your own system, and use it as a handy reference, and download the update every month. And if you know of any sites that you feel deserve a mention in Webwatch, drop me a line at gcattley@fpc.com.au, and I'll be happy to include them in an upcoming column.

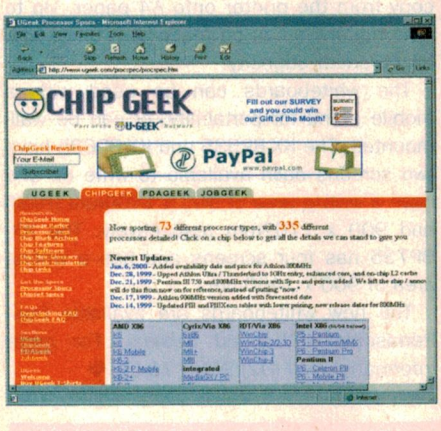
IT LOOKS AS THOUGH the people at **www.ugeek.com** have come up with the right logo — you really would have to be a propeller-head to fully appreciate this site.

Of it's four main areas (which also includes Ugeek, PDAGeek and JobGeek), the one area that I was particularly interested in was ChipGeek, which covers all the latest on all the latest in the CPU industry.

As I write, AMD have just released their 800MHz Athlon processor, and the site is buzzing with gossip, availability and production techniques of the new CPU. (Of course, buy the time you read this chip speeds will have doubled again, but never mind...)

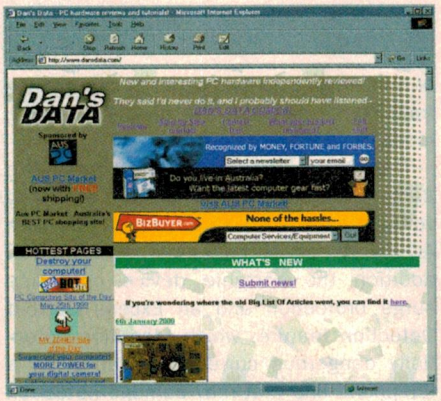
There are reviews of cooling systems, (including the 'Orb', which is round, so it must be good) a fair bit of discussion on the 1GHz Athlon-based system from Kryotech, and a look at who's going to be using UMC's .13 micron fab processes.

All up, an up to date, interesting site with lots of pertinent info.



DAN RUTTER is the sort of person you need on hand when buying PC hardware — he's spent the last five years writing about and reviewing everything from mouse mats to motherboards, and he's now putting his current reviews on his Dan's Data site at **www.dansdata.com**. It is an Australian site, with just about all the products reviewed currently available.

And if you aren't that interested in a bigger-than-Ben-Hur TNT2 video card comparison or the Mouse Bungee, then at least check up on the strangely popular How To Destroy Your Computer page, the How To Install A Big Fat Fan In Your Little PC tutorial, or the How To Make A Huge Battery Pack For Your Digital Camera tutorial...



MP3 PLAYERS are starting to explode on the market, and nowhere are the pyrotechnics more spectacular then in the automotive MP3 player market.

The idea is that you build up a mini PC a few buttons and an LCD as the user interface, and stuff the whole thing in the boot of your car. The LDC and controls mount on the dash, and you have instant access to up to 7000 singles (which is around 10 days worth of continuous music). There are many sites around that

cover the process of installing such a system into your car, truck or other wheeled device, but you're interested in all the gory details, you'd be best off going directly to **www.mp3car.com**, which is the home page of the MP3Car webring. Here you'll find links to heaps of 'I installed a PC in my boot' sites, as well as some that go into rather more detail.

If you don't like the idea of Windows running in your car, head on over to **www.empeg.com**, where you can read about (and buy!) the Empeg player — a self-contained MP3 player that mounts in the dash and runs Linux.

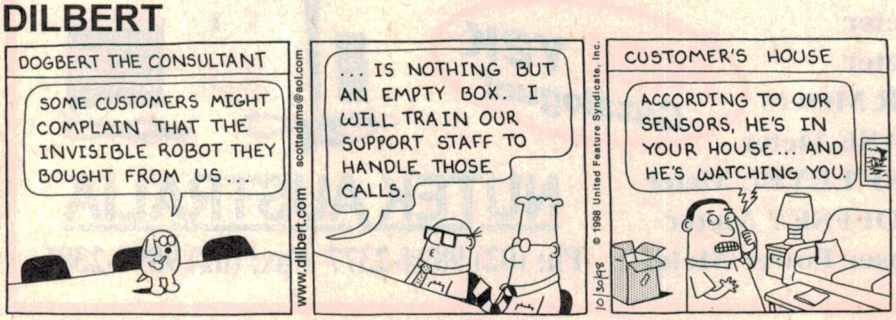
Of course you wouldn't have a clue as to the operating system the player used, if it weren't for that penguin that appears on the display...

HERE'S SOMETHING TO DO this weekend — make your own nitrogen laser... you'll find out how to do it with ordinary items you'd find around the house, and full instructions are given at **www.bestiary.com/moose/humour**.

Oh, alright, I have to admit that I found the page buried in the 'Allegedly Funny' website, along with other pages on how to make your own atom bomb, and a guide to leaving the planet. There's also lots of maths, programming and science jokes, along with the Laws of the Universe and even a paper on ray tracing foods, with a special emphasis on jelly.

It's all good fun, but be warned: there are a huge number of jokes here, and some of them cover, er, *other* topics, but as with everything else on the net, you take the good with the bad...❖

DILBERT



*****PLEASE NOTE OUR NEW EMAIL ADDRESS *****

IT'S ON AGAIN...(Sun 27 Feb. 2000) CENTRAL COAST FIELD DAY AUSTRALIA'S BIGGEST HOBBY ELECTRONICS MARKET DAY Lots of stalls including well known suppliers with new & used items. Just 5min. walk from WYONG rail station at the WYONG Race Course. Some of our Special bargains for the day will be listed on our web site. Be there..... we will!!!

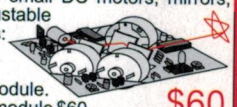
iF YOU DON'T CHECK OUT OUR BARGAIN CORNER REGULARLY YOU COULD BE MISSING OUT ON SOME GREAT BARGAINS LIKE....
Medical X-Ray machine $1500...Industrial X-Ray machine $1500... Labmaster Salt Spray Environmental Reliability Tester $2500...10Mhz-18Ghz synthesised signal generator $1600... NEC Port Replicator 2400 (Model: OP-560-65001). Connect all your peripherals to your NEC 2400 notebook $25...SMALL DISGUISED WALL SAFEs $35...7" Combination Pliers. $3ea...PC STYLE KEYSWITCHES $4ea...mobile phone accessories. And lots more . Just too many items to list here.

CCD NIGHT VISION!!!

Why buy a "low end (relative junk) Russian night viewer with which you can generally see about the same as with your own eyes? Cant afford a 2nd / 3rd generation viewer for 1000's of dollars? Both of these are fragile and have limited life! our viewers use a sensitive CCD camera, a high power IR illuminator and a 4" monitor. the unit is hand held but requires a rechargeable gel battery in a shoulder bag / bum bag to operate. You don't need moonlight or even starlight, it will work in total darkness with a range of up to 30meters!! what's more it is not fragile. The unit can even be used in full sunlight!! increadable low introductory prices! Click on CCD NIGHT VISION at...

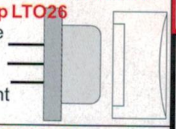
oatleyelectronics.com

SUPER LOW PRICE + LASER OMATIC LASER LIGHT SHOW KIT: i. Automatically changes every 5 - 60 s. Countless great displays from single multiple flowers, collapsing circles, tating single and multiple ellipses, stars, tc. Easy mirror alignment with "Allen Key". Kit inc. PCB, all on board comp-onents, three small DC motors, mirrors, precision adjustable mirror mounts: (K115) + very bright 650nM laser (LM2) module. Kit with laser module $60 Kit + laser module + plug-pack + instument style case all at a special price of $75



$60

IR LASER DIODE SECIAL 5mW 780nM (barley visible) Sharp LTO26
Requires 65mA.Diode plus focus lens (no housing) $18....constant current driver kit $10



LITHIUM-ION BATTERY PACK AUDIOVOX BTR600R 400mAh 7.2V
These battery packs contain two rechargeable Lithium-Ion cells, with an amazing 400 mAh capacity in such a small cell (51mm X14mm). Ideal for use as R/C receiver batteries etc. $4ea

KEY-CHAIN LASER POINTER
in a presentation box. Quality metal housing + 3X LR44 /AG13 bats. **FREE.** Extra bats. 50c Ea.

$10

Line lens+$0.80...X-hair lens (+) $0.80...Module (no case) only $8

PC MOTHER BOARD SPECIAL
40MHz - 486 new in original packag-ing with booklet 3 for $30 or $15 ea.

ALCOHOL BREATH TESTER KIT:
Ref: EA Oct. 96. Based on a high quality Japanese thick film alcohol gas sensor. The kit includes a PCB, all on board components and a meter movement: (K80) reduced from$40 to &25

*****NEW*****NEW*****NEW*****NEW*****
QUALITY AUSTRALIAN MADE FEATURE PACKED MINI ALARM SYSTEM. Features inc. boot release, central locking output, imobiliser output, indicator flash relay. Has with 2 key-fob transmitter keys.

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Drawn in proportion

WE HAVE FRESH STOCKS OF NEW 12V / 7Ah GEL BATTERIES
Priced at a fraction of their real value. 65mm (W) X 150mm (L) X 94mm (H),+ suitable trickle charger.

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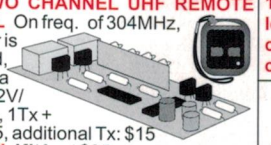
ONE / TWO CHANNEL UHF REMOTE CONTROL On freq. of 304MHz, transmitter is assembled, receiver is a kit, inc. 2 12V/ 12A relays, 1Tx + 1Rx kit:$45, additional Tx: $15 **1 CHANNEL Kit just** $25



TOLL FREE PHONE NUMBER
Sorry but we don't have one but if you call **02-95843564** 24hrs & leave a message & your number we will call you back ASAP at our cost. NO MOBILES. STD AND NZ. OK **(ORDERS ONLY)**

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Prices subject to change without notice

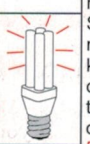
***** BRAND NEW *****
***** SUPER SPECIAL*****
5IN 1 REMOTE CONTROL
This remote is designed to work with 100's of different TVs, VCRs etc.(max. 5 at a time)all you have to do is select the right one from the chart supplied. 3 for $60 look for video switcher / remote special in this ad

$25

RADIO CONTROL MODEL SERVOS
These servos are ideal for robotics projects with good speed and high torque specs. They are supp-lied with a selection of output arms and disks plus mounting screws. If you ask us we will send a free simple circuit diagram to drive servos. **$18**

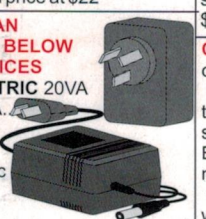
COUNTERFEIT STAMP MICRO.
Stamps are simple but powerful R.I.S.K. (reduced instruction set controller) micro processor that can be programed with it's own style of BASIC. It has 8 pins that can be configured for analogue or digital IO's, This is a copy of the popular Stamps with lots of application software available on the Internet. Just $60 with a free plug-pack If required software, book and cable kit is available for $90

****LOOK AT THIS****
12V- & 24V DC CFLs
12V-13W $25 24V-10W $23
Ideal for solar systems, caravans, safety lead light for car repair workshops etc.



CAMCORDER AND ACCESSORIES NiCad. BATTERIES 6V 2400mAh. Multi-fit type. These are new and in original pack. Two types. One type (sbc5223) fits CANON, BAUER and equivalent. The other (sbc5225) fits HITACHI, SABA, MINOLTA, RCA and equivalents. Just a fraction of the retail price at $22

NEW AUSTRALIAN PLUG PACKS AT BELOW WHOLESALE PRICES
GENERAL ELECTRIC 20VA 14VDC @ 700mA...
AUDIOVOX 9Vdc @ 500mA
AUDIOVOX 12Vdc @ 400mA....
9Vac ...@1A...
All $5 Ea. or 5 for $20 (can be mixed)



4IN VIDEO MONITOR
SCREEN 81 X 59mm
12Vdc... 375mA
204 X 104 X 41mm
Composite video in
Res. 450 TV lines
Weight 650g
Intro price of $145

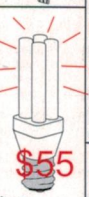
NICAD 7.2VCHARGER / DISCHARGER
Professional, built & tested fast NICAD charger and discharger PCB assembly. in a desktop case Switch mode circuit, Has 6 ICs, 3 indicator LED's, 3 power MOSFETS, a toroidal inductor etc. Nominal unregulated input 13.7V DC, 900mA charge current. Appears to use voltage slope detection for charge terminating, also has a timer (4060) to terminate the charge. We supply a thermistor for temperature sensing plus a cigarette lighter lead to use in a car **$7ea or 3 for 18.**

***** KIT SUPER SPECIAL *****
4 CHANNEL AUDIO/VIDEO SWITCHER
This is the most comprehensive video switcher kit we have seen. Features inc 4 channels switched sequentially with it's own adjustable timer or by external inputs like alarms, door switches and movement detectors, on board audio pre-amps (just requires microphones), out puts to control STOP/RECORD on your VCR, Optional modulator to use TV antenna input. This kit could be used to put a security channel on your TV to see who's at the door or in the yard or to monitor the kids playing outside. Unreal price of $45
5 in 1 remote $15 when bought with this kit.
See 5 in 1 remote elsewhere in this ad.

MICROWAVE DOPPLER TRANSCEIVER (movement detector)
5VDC operation @ 50mA. Operates at 10.525 GHz. can be pulse mode operated. Uses include alarms,radar experimentat-ion, auto-matic doors, obstruction de-tection for vehicles and robots etc. and lighting control as you enter or leave a room. Super special introductory price of $23or 2 for $40

$23

CFL INVERTER KIT
our very popular inverter. The improved design uses a larger transformer and a SG3525 switch Mode Chip.This very Efficient Driver kit can drive a number of CFL's from 12vdc. & would be great for lighting the weekender or caravan..
SPECIAL 1 inverter & 3 CFLs: $45



$55

PELTIER EFFECT DEVICES
Could be used for cooling overclocked PC CPUs. All 40 X 40mm.
4A △ T 65deg. Qmax 42W $25
6A △ T 65deg. Qmax 60W $27.50
8A △ T 65deg. Qmax 75W $30
Comes with info to build cooler / heater plus data. Some used heatsinks avail.

TWO MOTOR LASER LIGHTSHOW KIT
Inc. motors, mirrors, reversing switch & all electronic components. Can be controlled by variable DC input. Lots of patterns, flowers, stars etc. $16 **Laser module $8**

5KHz OSCILLOSCOPE $25!!!
Ref EA Aug. 96. Kit Connects to your PC parallel port & samples over 0-2V & 0-20V @ between1 per hour to 1per 100uS. Ideal to monitor battery charging etc. or used as a basic 5KHz oscilloscope! Our kit inc. all onboard components, PCB, box & software on 3.5 disk:(K90) $25

15A PLUS 12V/24V HI EFFICIENCY SOLAR REGULATOR KIT
Our regulator suits up to 100W panels. Features precision voltage ref., Hi eff. saturating MOSFET, Shotky diode isolation, charge indicator and a current limiter so it can be used with car battery chargers, generators etc. Low cost due to the use of some unused recycled components. complete kit inc. case $29... See our bargain solar panels in this ad..

USED AUSSIE MADE TRANSFORMER
240V PRIMARY (120+120),ES screen, Secondary....1X12V@1.1A...10V@5A...7 V@ 5A... 12-0-12V@7.5A. 100 X 115 X 100mm. bargain at $15

NEW ULTRA-SONIC RADAR KIT
This U/S radar can sound a buzzer or flash a light on your dash to let you know when your car is near another car or object. Inc. adj. upto1M. Can drive a relay or buzzer. kit inc. PCB + all on-board parts including Ultra-sonic transducers and buzzer for $16

UHF AUDIO / VIDEO TRANSMITTER KIT
Kit includes all components needed.....
PCB plus all on-board components, connectors, switch, metal case, telescopic antenna, twin RCA A/V lead, all that is needed to complete the full kit. 12Vdc @10mA operation. Ideal for trans-mitting audio and video around you home.. Complete Kit for just $28

suitable plugcack $5

VIDEO CAMERAS

HOUSED CAMERAS
CCD COLOUR IN SWIVEL CASE $190
PCB CAMERAS
B/W CCD CAMERAS $89
pinhole (60deg.),
92 deg,120 deg.
add $10 for 150 deg.

CMOS SUGAR CUBE CAMERAS $70

ALL WITH A FREE VHF MODULATOR & SUITABLE PLUG PACK

$160 **$70**

SOLAR PANEL / FAN SPECIAL
SIEMENS brand Poly crystalline cells. Voc Isc 1W output. 4 panels req. to charge 12V batteries. Specs: Open circuit voltage: 5.7v...Short circuit current: 0.22A Peak Power: 1.0W @ 100mW / sq cm. 160mm x 55mm x 5mm...Flying lead: Dual cable 25cm. Place under glass for outdoor use.$10ea. or 4 for $36...
PANAFLOW 60mm 12Vdc fans.
$3 ea or 4 for $10
Or 1Fan + 1 Solar Panel for the combined bulk prices...$11.50...One of these solar panels will run one of these fans in overcast conditions.

16 X 2 line LCD display $12ea/3 for $30: Soft ware to drive display from a PC from Silicon Chips web site

...it's also projecting your image as well.

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